



SRI VENKATESWARA COLLEGE
(University of Delhi)
Managed by Tirumala Tirupati Devasthanam (TTD)

NAAC Accredited "A+" Grade (2022)

Benito Juarez Road
Dhaulta Kuan, New Delhi -110021
Phone: 91 11-24118590
Fax: 911124118535
Webpage: www.svc.ac.in
Email: principal@svc.ac.in

CRITERIA 1

Supporting Document

1.3.3 Number of students undertaking project work/field work/ internships.

This file includes certificates of internships by the students during the year.


Coordinator, IQAC
Prof. Vartika Mathur
Sri Venkateswara College
(University of Delhi)
Dhaulta Kuan, New Delhi-110021


Principal
श्री वेंकटेश्वर महाविद्यालय
Prof. Vajjala Ravi
Sri Venkateswara College
विश्वविद्यालय / University of Delhi
धौला कुआँ, नई दिल्ली / Dhaulta Kuan, New Delhi-21



Sri Venkateswara College

University of Delhi

Benito Juarez Marg

Dhaura Kuan, New Delhi 110021

E-Mail: vandana.malhotra@svc.ac.in

vmal71@gmail.com

Dated: 30 August, 2023

CERTIFICATE FOR INTERNSHIP

This is to certify that Mr. Sidhant Bhardwaj, a third-year student at Sri Venkateswara College, University of Delhi pursuing a Bachelor Degree (Hons) in Biochemistry successfully completed an 8-week internship program at the TB Molecular Biology & Signaling Lab at Sri Venkateswara College, University of Delhi from **15.06.2023 to 14.08.2023** under my guidance. The TB Molecular Biology & Signaling Lab @ SVC focuses on the signaling networks of *Mycobacterium tuberculosis* and underlying mechanisms of persistence.

During this internship, Sidhant learned about the computation tools used to retrieve gene and protein sequences, performed sequence homology, and designed PCR primers. Additionally, he isolated plasmid DNA from bacterial culture, used restriction enzymes, and learned how to perform PCR. He also learned various methods of protein purification including Affinity Chromatography. Sidhant is a hardworking student who is committed to his goals. He was very regular and displayed a natural curiosity, scientific interest, and analytical skills required for research. He was organized and methodical in his work ethics and also has good writing skills.

I wish him all the best in his future endeavors.

Dr. Vandana Malhotra
Assistant Professor
Department of Biochemistry
Sri Venkateswara College
University of Delhi

Credential ID :YD 2022 0022



CERTIFICATE OF COMPLETION

Samriti Kapur

YOUTH INDIA FOUNDATION PRESENTS THIS CERTIFICATE TO YOU FOR YOUR
DEDICATION AND SERVICE AS GRIEVANCES INTERN FOR THE PERIOD FROM
4/6/2022 TO 7/6/2022, WITH A GRADE POINT 7.7 OUT OF 10.
WE WISH YOU LUCK FOR YOUR CAREER

Ishika

Ishika Mahajan
HR HOD

YOUTH INDIA FOUNDATION

Daksh

Daksh Dhingra
President

YOUTH INDIA FOUNDATION

Principal
Principal
श्री वेङ्कटेश्वर महाविद्यालय
Sri Venkateswara College
दिल्ली विश्वविद्यालय / University of Delhi
धौला कुआँ, नई दिल्ली / Dhola Kuan, New Delhi-21

DATE- 25APR2023



INTERNATIONAL INSTITUTE OF SDGs & PUBLIC POLICY RESEARCH

CERTIFICATE OF APPRECIATION
This certificate has been presented to

SAMRITI KAPUR

THIS IS TO CERTIFY THAT MS. SAMRITI KAPUR IN
INTERNATIONAL INSTITUTE OF SDGs & PUBLIC POLICY
RESEARCH HAS WORKED HARD UNDER OUR SUPERVISION
WITH HER MERITORIOUS SKILLS.

THIS INFORMATION AND FINDINGS PRESENTED IN THE
CERTIFICATE
SEEM TO BE AUTHENTIC, SHE POSSESSES GOOD CHARACTER
AND SKILL. WE WISH HER EVERY SUCCESS IN LIFE.

DURATION : 3 MONTHS

FIELD -HR AND MANAGEMENT


AMARJEET

(AUTHORISED SIGNATORY)



IAS INTERNATIONAL
ACCREDITATION
SERVICE



INTERNATIONAL
RELATIONS &
SECURITY ANALYSIS



श्री वेङ्कटेश्वर मिडिक्वालिटी
Sri Venkateswara College
दिल्ली विश्वविद्यालय University of Delhi
धोला कुआँ, नई दिल्ली / Dhola Kuan, New Delhi

Email: chairman@iisppr.com

<https://www.iisppr.com/>

Regd. Office: 1st floor, Azad Market,
Near Aligarh Muslim University

BADHEIN SABKE KADAM
MYRA-EK PAHEL

CERTIFICATE OF CONTRIBUTION

This Letter is proudly presented to

Samriti Kapur

for her outstanding contribution as an Educator in our initiative

Badhein Sabke Kadam.

She was associated with Myra from 18 April, 2022 to 25 June, 2022

and displayed commendable commitment in providing supplementary online
education to our students from the under-served sections of society.



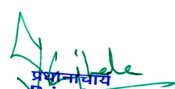
AKSHARA ALOK

Founder



APURVA SHARMA

Founder


प्रधानाचार्य
Principal
श्री वेङ्कटेश्वर महाविद्यालय
Sri Venkateswara College
दिल्ली विश्वविद्यालय / University of Delhi
धौला कुआँ, नई दिल्ली / Dhauila Kuan, New Delhi-21



CERTIFICATE

This certificate is proudly presented to

Divyanshu Agarwal



Scan the QR code to verify

on successful completion of "1 month" internship in "Graphics Design" from
18-Mar-2024 to 18-Apr-2024 at studifysuccess

sanjana

FOUNDER



abhishek

CEO

Principal
प्रधानाचार्य
Principal
श्री वेङ्कटेश्वर महाविद्यालय
Sri Venkateswara College
दिल्ली विश्वविद्यालय / University of Delhi
धौला कुआँ, नई दिल्ली / Dhaula Kuan, New Delhi-21



July 25, 2024

Internship Letter

Dear Surbhi Kumari,

Subsequent to our discussion, we are pleased to engage with you as an Intern with one of the Paytm Team.

You are bound by the company's code of conduct & ensure to keep all business information confidential during your association with us as an intern trainee.

Mentioned below are the details of your training tenure:

- **Start date:** July 29, 2024
- **End date:** September 27, 2024
- **College:** Sri Venkateswara College, Delhi
- **Stipend:** ₹0 Per month
- **Location:** Remote

You will be governed by the disciplinary norms of the Company.

Note: This letter should not be referred as employment or offer of employment.

Best Regards,

Amrit Jami

Human Resources

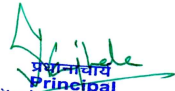
One97 Communications Limited.

One Skymark, Floor No. 6th to 22nd,

Tower-D, Plot No. H-10B, Sector-98,

Noida

www.paytm.com


Principal
श्री वेङ्कटेश्वर महाविद्यालय
Sri Venkateswara College
दिल्ली विश्वविद्यालय / University of Delhi
धौला कुआँ, नई दिल्ली / Dhaula Kuan, New Delhi-21



E-7/16-FF, Vasant Vihar, New Delhi – 110057
Email: jayashree@consumersindia.co.in
Web: www.consumersindia.in
Blog: <https://drjayashreegupta.blogspot.com/>

The Society for Upliftment of Masses
An NGO in Special Consultative Status with the
ECOSOC of the United Nations



Certificate

This is to certify that

HANIKA AGGARWAL (W-278)

Participated in the

Online 'We for Change' Research Internship Programme

From June 10, 2023 to July 31, 2023

& has successfully completed it.

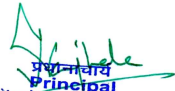
Dr Jayashree Gupta
President, Consumers India

Ameeta Gupta
Convenor, Youth Activities

Renuka Mehra
General Secretary, SUM



This is an E-certificate. No signature is required.


Principal
श्री वेङ्कटेश्वर महाविद्यालय
Sri Venkateswara College
दिल्ली विश्वविद्यालय / University of Delhi
धौला कुआँ, नई दिल्ली / Dhaulia Kuan, New Delhi-21



Ref No: HROPS/IL/878

Date:28-06-2024

Internship Letter

Dear Jaiwardhan Singh Kang

We are happy to confirm your request for an Internship with Delhivery Limited, subject to the following:

1. Your training will be for a period of 2 Months ' starting 22-07-2024 .
2. You will be assigned to the department Accounts as Intern based in GGN_HQ05 # (Haryana),Gurgaon, Haryana, India, (Corporate) under the supervision of .Kapil Bagga
3. You will be provided with a stipend not exceeding **INR 10000 per month**, towards meeting your daily expenses, through your bank account, during the subsequent calendar month.
4. You are expected to abide by the company's guidelines on code of conduct and expected behaviour.
5. You shall, upon completion of your internship, also return to the company, any assets, documents etc. in your possession
6. You shall not use any proprietary information, gathered as part of the internship with Delhivery Ltd, without prior written consent of the undersigned.
7. This Internship can be terminated by either party by providing a notice period of 7 days.
8. This internship does not guarantee any employment with Delhivery Ltd, or its associates.

We trust that you will find this a challenging and exciting opportunity to learn from the Delhivery team. Please return a signed copy of this letter to acknowledge your acceptance to the above.

I,Jaiwardhan Singh Kang hereby accept the above mentioned terms and conditions and further agree to abide by the rules and regulations of the company.

Yours sincerely,

Ayush Dwivedi, Senior Director

प्रधानाचार्य
Principal
श्री वेङ्कटेश्वर महाविद्यालय
Sri Venkateswara College
दिल्ली विश्वविद्यालय / University of Delhi
धौला कुआँ, नई दिल्ली / Dhaula Kuan, New Delhi-21

09 August 2023

Grant Thornton Bharat LLP
(formerly Grant Thornton India LLP)
21st Floor, DLF Square
Jacaranda Marg, DLF Phase II,
Gurugram - 122002
Haryana, India
T +91 124 462 8000
F +91 124 462 8001

Experience Certificate

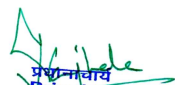
This is to certify that Mr. Ashmit Bansal did his summer internship with Grant Thornton Bharat LLP from 05 June 2023 to 31 July 2023.

We wish him all the very best in all his future endeavours.

For Grant Thornton Bharat LLP

eSigned using DSC (Leegality.com
- R2Qet7G)
SATYA NAND JHA
Date: Wed Aug 09 18:18:42 IST
2023

Satya Jha
Partner


Principal
श्री वेङ्कटेश्वर महाविद्यालय
Sri Venkateswara College
दिल्ली विश्वविद्यालय / University of Delhi
धौला कुआँ, नई दिल्ली / Dhaula Kuan, New Delhi-21

To Whom It May Concern

1 July, 2024

Mr. Manish Gupta.

This letter is to certify that Mr. Manish Gupta successfully completed his 30 day internship with Digi Optimizer. **on "Business development (U.S shift)". His internship tenure was from 1 June, 2024 to 30 June, 2024.** He was Working with Digital marketing Team and was actively & diligently involved in the projects and tasks assigned to him.

During the span, we found him punctual and hardworking person. His learning powers are good and he picks up swiftly.

We wish him a bright future.

Best Regards,



Vibhor Gupta | Director



CERTIFICATE

OF ACHIEVEMENT

THIS CERTIFICATE IS AWARDED TO

VAISHALI DHAKAD

This is to certify that she has successfully completed an internship as
a Digital Marketing Intern at **Digital Professor** from **November 3, 2023,**
to **May 10, 2024.**



DR MANISH MISHRA

Founder

प्रधानाचार्य
Principal
श्री वेङ्कटेश्वर महाविद्यालय
Sri Venkateswara College
दिल्ली विश्वविद्यालय / University of Delhi
धौला कुआँ, नई दिल्ली / Dhaula Kuan, New Delhi-21



INVEST INDIA
NATIONAL INVESTMENT PROMOTION
& FACILITATION AGENCY

27 March 2024

TO WHOM IT MAY CONCERN

This is to certify that **Inam Zafar**, has successfully completed the internship program at **Invest India**.
Inam worked with the **Startup India** team from **04 December 2023 to 04 March 2024**.

During his internship tenure, he completed all his assignments successfully.

We wish **Inam** all the best for his future endeavors.

Amulya Sah
Sr. Vice President & CHRO
Invest India

Principal
श्री वेङ्कटेश्वर महाविद्यालय
Sri Venkateswara College
दिल्ली विश्वविद्यालय / University of Delhi
धौला कुआँ, नई दिल्ली / Dhaula Kuan, New Delhi-21

WWW.INVESTINDIA.GOV.IN

First Floor Vigyan Bhawan Annexe, Maulana Azad Road, New Delhi 110011+91-11-2304 8101 |CIN : U91100DL2009NPL197064

Experience Letter

Date: 15 April, 2024

To whom it may concern,

This is to certify that Kritesh Keswani has interned as an Equity Research Intern at Business Quant, for a period of 4 months, between November 2023 and April 2024.

He worked on tasks, such as:

- updated quarterly and annual KPIs for over 500 US-listed companies,
- mentored other interns whenever they reached out to her, for guidance,

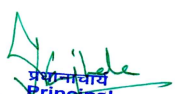
Kritesh has maintained a professional work ethic at all times throughout his internship tenure with us.

I wish him all the best for his future endeavors!

Sincerely,
Piyush Arora,
Founder & CEO

For Quant Expeditions LLP

Designated Partner


Principal
श्री वेकटेश्वर महाविद्यालय
Sri Venkateswara College
दिल्ली विश्वविद्यालय / University of Delhi
धौला कुआँ, नई दिल्ली / Dhaula Kuan, New Delhi-21

संजीत सिंह, भा.रा.से.
Sanjeet Singh, IRS
वरिष्ठ सलाहकार
Senior Adviser
Tel. : 011-23096513
E-mail : sanjeet@gov.in



भारत सरकार
नीति आयोग, नीति भवन
संसद मार्ग, नई दिल्ली - 110 001
Government of India
National Institution for Transforming India
NITI Aayog, Parliament Street,
New Delhi - 110 001
Dated: 24th April, 2024

TO WHOMSOEVER IT MAY CONCERN

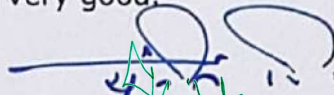
This is to certify that **Mr. Inam Zafar**, a student of Sri Venkateswara College, University of Delhi, has successfully completed his internship with NITI Aayog, Government of India under Foreign Trade and Commerce vertical, from **1st March, 2024 to 15th April, 2024**.

During the period of internship, he worked on a few of NITI Aayog's and his independent projects:

- Formulation of 'FREE TRADE WAREHOUSING ZONE' policy specifically towards determination of new trade routes.
- Current evaluation of work load on Indian Ports.
- Drafted Case studies on bottlenecks in transportation costs at local, regional and global level.
- Researched and cumulated the biggest producer and exporter of the 30 critical minerals launched by Ministry of Mines 2024.
- Research work on historical and present dynamics of India's foreign policy and trade relationship with Africa.
- Recommendations and way forward for leveraging African union as a pivot towards 'SAB KA SAATH, SAB KA VIKAS'.
- Policies for upliftment of the central countries of Global South.
- Analysis of Transportation cost in India and its comparison with asia and the world.
- Proposals to improve Inter-state, Indo-Pacific and Global transportation cost.

His performance throughout the internship has been very good.

I wish him success in his life and career.


प्रधानाचार्य
Principal
श्री. वेङ्कटेश्वर कॉलेज, मुंबई विद्यापीठ
Sri Venkateswara College
दिल्ली विश्वविद्यालय / University of Delhi
धौला कुआँ, नई दिल्ली / Dhaula Kuan, New Delhi-21
(संजीत सिंह)
(SANJEET SINGH)
वरिष्ठ सलाहकार / Senior Adviser
नीति आयोग / National Institution
for Transforming India (NITI)
भारत सरकार / Govt. of India
नई दिल्ली / New Delhi



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Behind Vishavkarma Dharmshala, Jiwan Nagar, KOTKAPURA-151204

Ref No.....

Date 30.09.2023

TO WHOMSOEVER IT MAY CONCERN

Internship Completion Certificate

This is to certify that **Ms. Paavni Aggarwal**, D/o **Lavneet Aggarwal**, a student of B.Com (Program) Batch 2022-25, Roll no. **0922002** in **Sri Venkateswara College, Delhi University** has been on internship under my guidance & supervision.

Her performance report is as follows:

- Duration of Internship: From **1st August, 2023** to **30th September, 2023**
- Department under which student worked: **Accounts Department**
- Role Assigned: **Manager's Assistant**
- Results: **Stock management was done at very best**
- Pre-placement offered: **No**
- She was an excellent intern who was punctual and never had a leave in entire duration. She was enthusiastic towards her work and never said no to any work I asked her to do. She is a quick learner. She acquired the skills in departments of basic accounts as well as inventory management as her core work area.
- Final Rating: **Outstanding**

Lavneet Aggarwal
Lavneet Aggarwal
Manager

FOR MODERN MARBLE HOUSE

Yashpal Aggarwal PROP.
Yashpal Aggarwal
Principal
Sri Venkateswara College
Dhola Khori, New Delhi-21
Dhola Khori, New Delhi-21



सत्यमेव जयते

OEA-16048(11)/1/2023-ADMIN-I
Government of India
Ministry of Commerce and Industry
Department for Promotion of Industry and Internal Trade (DPIIT)
Office of Economic Adviser

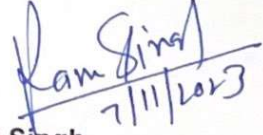
7-11-2023

To whomsoever it may concern

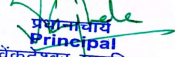
This is to certify that **Shri Aryansh Mohan**, S/o Shivendra Mohan Punyani, a student of BA (Hons.) Economics from Sri Venkateswara College, University of Delhi, has successfully completed his internship with Office of Economic Adviser, DPIIT, M/o Commerce & Industry, Government of India from 3rd July, 2023 to 4th September, 2023. During the period of internship, he worked on project assigned to him, as given below, in Trade and Fiscal Policy (TFP) Division of this office.

- i. Authored a research report on "**Trade relations between India and BRICS plus countries through Gravity model approach**".
 - ii. In the report, it was suggested that India can use BRICS plus as a trading block.
2. During the period of his internship programme, he was punctual and hardworking.
3. I wish him every success in his life and career.

Place: Udyog Bhawan, New Delhi
Dated: 07/11/2023


Ram Singh
Deputy Director (Admin)

राम सिंह / RAM SINGH
उप निदेशक / Deputy Director
आर्थिक सलाहकार का कार्यालय / O/o Economic Adviser
वाणिज्य एवं उद्योग मंत्रालय / Min. of C.&I.
उद्योग भवन, नई दिल्ली-110011
Udyog Bhawan, New Delhi-110011


प्रधानाचार्य
Principal
श्री वेंकटेश्वर महाविद्यालय
Sri Venkateswara College
दिल्ली विश्वविद्यालय / University of Delhi
धौला कुआँ, नई दिल्ली / Dhoola Kuan, New Delhi-21

PROOFS

PLACEMENTS

1) Futures First

Date of Joining - Futures First, Jaipur

Hiimani Sharma

to Hiimani, Hiimanshi

Mon, May 21, 9:52 PM

☆🔍🔄⋮

Hi All,

Welcome to Futures First!

We are pleased to inform you that the official date of joining has been scheduled for August 6th, 2024 at Jaipur branch

To ensure a smooth onboarding process, please provide your consent by completing the below form by EOD 29th May 2024.

[Joining Consent Form](#)

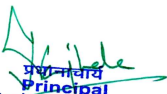
Regards,

Dr. Hiimani Sharma | VP - HR & Operations | Futures First

Internal: 8703 | Phone: +91 141 4070400 | [www.futuresfirst.com](#)

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2) Willis Towers Watson


Principal
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Sri Venkateswara College
दिल्ली विश्वविद्यालय / University of Delhi
धौला कुआँ, नई दिल्ली / Dhaula Kuan, New Delhi-21



Willis Towers Watson India Private Ltd.
2nd Floor, Tower B, Unitech Business
Park, South City-1, Gurgaon - 122001,
Haryana, India Tel +91 124 432 2800

Ref No: 202305921/855/2024

8 December 2023

Divyam Chutani

Employment Letter

Dear Divyam,

With reference to our discussions regarding your employment, subject to the Conditions of Offer – Annexure 1, we are pleased to offer you a position with Willis Towers Watson India Private Limited (hereinafter the "Company"), a Willis Towers Watson Company and this letter outlines the main terms of your employment with us. Further details of our employment terms are contained in the Associate Handbook or on Company's Intranet site (within the HR pages of the Company's Intranet site). A selection of the key terms from Company's intranet site is enclosed. You will have full access to Company's intranet site upon your arrival at the Company.

Position and location

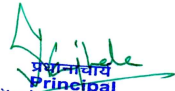
You shall be employed in the position of **Analyst** and you will join us at career level **68**. You shall be initially posted at the Company's **Gurgaon** office located at **7th Floor, Emaar Capital Towers 2, Mehrauli-Gurgaon Road, Unit 07-001, Sector 26, Sikanderpur Ghosi, Gurugram, Haryana, India 122002**. However, at the sole discretion of the Company, you are liable to be transferred /or travel from one place to another place anywhere in India or abroad and /or to any of the offices of the Company's successors, affiliates, associates, group companies and/or entities in which the Company may have an existing or future interest.

You will also work, if required, for the Company's successors/affiliates/ associates/ group Companies. The salary and emoluments mentioned herein cover your services for the Company, as well as for any of its successors/affiliates/associates/group Companies. You may also have the opportunity to be seconded for a period to another location in India or overseas.

You will initially report to **Abhilasha Goyal**. However, reporting is subject to change at the sole discretion of the Company. The nature of the Company's business requires that you are flexible in your approach to work in order to service the best interests of the Company's clients. Accordingly, you agree that the Company may at any time vary your position, scope of duties, and responsibilities, or require you to undertake different duties or change your reporting line in order to take account of the changing needs of the Company's business and your role within it. In any such circumstances, the Company will discuss with you any proposed changes and may offer you a new position or altered duties that it considers to be appropriate to your skills and experience at the time of the change.

Willis Towers Watson India Pvt Ltd
Registered Office: 2nd Floor, Tower B, Unitech Business Park, South City-1, Sector-42 Gurgaon, Haryana (India) 122001, T + 91 124 432 2800
EMAIL ID: hr@williswatson.com OR careers@williswatson.com OR hr@williswatson.com OR careers@williswatson.com
WEBSITE: willis.com

3) Nomura Research Institute & Consulting Solutions


प्रधानाचार्य
Principal
श्री वेकटेश्वर महाविद्यालय
Sri Venkateswara College
दिल्ली विश्वविद्यालय / University of Delhi
धौला कुआँ, नई दिल्ली / Dhaula Kuan, New Delhi-21



Nomura Research Institute Consulting and Solutions India Pvt. Ltd.

(Formerly known as Nomura Research Institute India Pvt. Ltd.)
CN: U74999HR2011FTC044212
7th, Tower A, Building No. 5, DLF Cyber City, Phase III, Gurgaon, Haryana, India - 122002
TEL: +91-124-4168900, URL: <http://india.nri.com>

Date: 04-March-2024

To:
Mr. Divyam Chutani

EMPLOYMENT OFFER LETTER

Dear Divyam,

We are pleased to offer you employment as a Associate Researcher in Global Knowledge Center with Nomura Research Institute Consulting and Solutions India Private Limited (hereinafter referred to as 'Company'). We are certain that you will be an outstanding addition to our team.

1. JOB DESCRIPTION AND RESPONSIBILITY

Group: Global Knowledge Center
Title: Associate Researcher

2. AGREEMENT ON PERIODS

Work Commencement Date: 22-July-2024
Probation Period: 6 months

3. REMUNERATION

[Fixed annual salary totaling (gross)] INR 508,800 (a+b).

Fixed monthly salary totaling (gross) INR 480,000 (a), paid in 12 equal installments at the end of each respective month. Monthly salary would be INR 40,000.

Company will provide INR 28,800(b) as employer's contribution for statutory provident funds when the employee opts for provident funds. It will be paid in 12 equal installments.

[Performance bonus (gross)]

Performance evaluation will be done according to Company's HRM policy once a year, which is April. When the employee achieves his/her 100% target, his/her annual bonus will be INR 40,000 (c).

With 100% performance bonus, the employee's annual package would be INR 548,800 (a+b+ c).

[Other Benefits]

Company has Gratuity policy in addition to the package mentioned above.

Company provides medical insurance for the employee plus spouse, 2 children.

Please note that the employment offered and the terms of the employment as provided in this offer letter will only come into effect and be binding on the Company, once you sign the employment agreement ('Employment Agreement') on or before the expiry of the Work Commencement Date, mentioned above. Further, it should be noted that, if you fail to sign the Employment Agreement on or before the Work Commencement Date, then this offer of employment will be deemed to have been withdrawn and terminated by the Company with effect from the Work Commencement Date. Please note that a draft format of the employment agreement will be sent to you for your review and confirmation. We sincerely request you to complete the signing of the Employment Agreement on or before the Work Commencement Date to ensure that your employment with the Company starts on and from the Work Commencement Date in accordance with the terms and conditions of the Employment Agreement.

This letter is valid till 15-March-2024. We will be delighted to have your acceptance by signing this letter and look forward to working with you in NRI soon.

Yours Sincerely,
For Company,

1/2 TJ

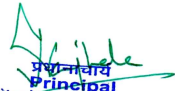
Authorized Signatory
Shigeharu Satake
President



As acceptance,

Mr. Divyam Chutani

4) Ernst & Young India


Principal
श्री वेङ्कटेश्वर महाविद्यालय
Sri Venkateswara College
दिल्ली विश्वविद्यालय / University of Delhi
धौला कुआँ, नई दिल्ली / Dhaula Kuan, New Delhi-21



Ernst & Young LLP
3rd & 8th Floor
Worldmark-1
IGI Airport Hospitality District Aerocity
New Delhi - 110 037, India
Phone: +91 11 6671 8000
Fax: +91 11 6671 9999

15 November 2023

Mr. Divyam Chutani
J 30 A, Beri Wala Bagh, Hari Nagar, New Delhi -
110064, New Delhi, 110064

Your appointment as Analyst in Business Consulting Risk

Dear Divyam,

With reference to your application and the subsequent interview(s) you have had with us, we are pleased to confirm your appointment for the above position in **Ernst & Young LLP** subject to the following terms and conditions. Further, we understand that you have appeared / will be appearing for Final exams. This appointment is subject to you clearing said exams. In case you are unsuccessful this appointment will automatically be void.

1. Job Title

You shall be designated as **Analyst** in Band **6**.

The designation and band are for reference only and do not entitle you to any benefit other than as has been specified in this letter, or intimated to you in writing in respect, thereof. The Management retains the right at all times to change / modify / amend the titles/ designations or to rearrange the band structure, which may impact the above fact.

2. Annual compensation

- Your annual compensation including benefits, allowances, and perquisites, if any, payable by the Firm is **INR 4,50,000 per annum (Rupees Four Lakh Fifty Thousand Only)**. A typical break up is provided as an Illustration in Annexure A to this Agreement.
- Besides this you will be eligible for Gratuity as per Payment of Gratuity Act, 1972. You may note that as per the Act provisions there is an upper limit of 20 Lakh.
- Your compensation will be subject to income tax as per the provisions of the Income Tax Act, 1961.

3. Date of joining

As agreed, you shall join the services of the Firm on **15 July 2024**.

4. Probation

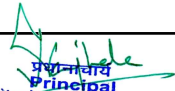
You shall be on probation for a period of (6) months from your date of joining, the period of which may be further extended at the discretion of the Management. After completion of the probation period and subject to your performance your appointment shall be confirmed in writing.

Ernst & Young LLP, a Limited Liability Partnership with LLP Identity No. AAB-4343
A member firm of Ernst & Young Global Limited, Regd. Office: 22 Camac Street, 3rd Floor, Block C, Kolkata - 700016

INTERNSHIPS

1) Data Analytics Intern, NITI Aayog

Proof:


प्रधानाचार्य
Principal
श्री. वेण्कटेश्वर मेहाविद्यालय
Sri Venkateswara College
दिल्ली विश्वविद्यालय / University of Delhi
धौला कुआँ, नई दिल्ली / Dhaula Kuan, New Delhi-21



Dr Neelam neelam.patel@gov.in via gov.in

Mon, Jul 3, 4:33 PM



to me, Dr ▾

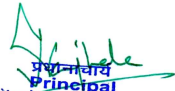
Dear Divyam,

With reference to your application for engagement as an Intern (offline) in the Agriculture Vertical, NITI Aayog, the Agriculture Vertical will engage you as an intern for a period of **two months** on the following terms and conditions:

- (i) The assignment is **unpaid**.
- (ii) Your work allocation will be decided in consultation with the Senior Adviser.
- (iii) You will be required to submit a paper/report/project at the end of your assignment and present the same to members of the Vertical.
- (iv) You will also be required to assist the Division in other tasks as needed.

You may please inform us about the acceptance of the offer of internship asap and also directed to report on **July 3, 2023 (Monday)**, in Room No. 204, 2nd Floor, NITI Aayog, Sansad Marg, New Delhi-110001. Your work will be supervised by the Senior Adviser (+91 9868060359 ; neelam.patel@gov.in). .

(Dr. Neelam Patel)
Sr. Adviser (Agri.)
NITI Aayog
Tel: [011 23096613](tel:01123096613)


Principal
श्री वेङ्कटेश्वर महाविद्यालय
Sri Venkateswara College
दिल्ली विश्वविद्यालय / University of Delhi
धौला कुआँ, नई दिल्ली / Dhaula Kuan, New Delhi-21

Dr. NEELAM PATEL
SENIOR ADVISER
Tel : 011-23096813
E-mail : neelam.patel@gov.in



भारत सरकार
नीति आयोग, संसद मार्ग,
नई दिल्ली-110 001
Government of India
NATIONAL INSTITUTION FOR TRANSFORMING INDIA
NITI Aayog, Parliament Street,
New Delhi-110 001

No. Q-11050/22/2016-Agri.

Dated: 02.11.2023

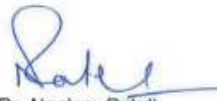
TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Mr. Divyam Chutani**, B.A. (Hons) Economics, Sri Venkateswara College, University of Delhi, has successfully completed his internship with NITI Aayog, Government of India from 1st July 2023 to 30th September 2023.

During his internship tenure, he worked on the project entitled 'Achieving Self Sufficiency in Edible Oils'. He forecasted India's National, State-wise & crop-wise production for Edible Oilseeds till 2047-48 using multiple techniques including Autoregressive Integrated Moving Average (ARIMA) models, Regression Analysis and Machine Learning Neural Networks. He also conducted a training session for fellow interns in the vertical on ARIMA modeling in the R programming language and tools like IBM SPSS & STATA.

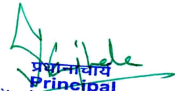
In addition, he also assisted the Agriculture Vertical in its day-to-day activities. His performance during the internship has been impeccable.

Overall, we found him to be very creative, sincere and hardworking. We have every confidence in his continued progress as he advances in his career and look forward to working with him again in the future.


(Dr. Neelam Patel)



2) Commercial Mobility Intern, Frost & Sullivan


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धौला कुआँ, नई दिल्ली / Dhaula Kuan, New Delhi-21

June 17, 2024

Sub: Relieving Order

This is to state that **Mr. Divyam Chutani** worked with **Frost & Sullivan India Pvt. Ltd.** as an Intern from April 08, 2024, to June 07, 2024. He was a part of the Mobility team.

He has been relieved from services with effect from the close of business hours of June 07, 2024.

We wish him all the very best in his future endeavors.

Yours truly,

For Frost & Sullivan



Sarala Santhirasekaranathan
Senior Manager - HR & Talent acquisition
Frost & Sullivan (India) Pvt. Ltd.

Beijing
Mumbai

Bengaluru
New York

Chennai
Paris

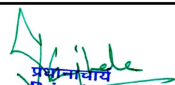
Frankfurt
San Antonio

Jakarta
Silicon Valley

Kuala Lumpur
Singapore

London
Tokyo

3) Ernst & Young Internship, Strategy & Transactions Division (Infrastructure Advisory Vertical)


Principal
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धौला कुआँ, नई दिल्ली / Dhaula Kuan, New Delhi-21



Ernst & Young LLP
6th & 7th floor, 67, Institutional Area,
Sector- 44, Gurgaon,
Haryana, 122003

Tel : +91-124-464 4000

Internship Certificate

09-Jan-2024

Dear Divyam,

This is to confirm the successful completion of Divyam Chutani's internship with us from 20-Sep-2023 to 20-Nov-2023.

During the internship period, Divyam worked on the project titled, Strategic Proposal for MoFPI, and was assigned to the TCF-LA-PF Infrastructure Adv function in SaT.

He showed willingness to expand his knowledge and worked enthusiastically on the project.

We wish Divyam continued success in his academic pursuits and professional journey.

Warm Regards,

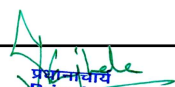
Anand Parab
Authorised Signatory

Ernst & Young LLP is a Limited Liability Partnership with LLP Identity No. AAS-4343.
A member firm of Ernst & Young Global Limited. Regd. Office: 22, Camac Street, Block 'C', 3rd Floor, Kolkata - 700 011

EY refers to the global organization and/or one or more of the independent member firms of Ernst & Young Global Limited

4) UN Millennium Fellowship

Proof:


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धौला कुआँ, नई दिल्ली / Dhaula Kuan, New Delhi-21



Sam Vaghar, MCN via gmail.mcsv.net
to me ▾

Sat, Aug 12, 3:46AM (13 days ago) ★

Divyam Chutani
University of Delhi South Campus

Dear Divyam,

The United Nations Academic Impact and Millennium Campus Network proudly present the [Millennium Fellowship](#). The application process for the Class of 2023 was very competitive, with 44,000+ applicants from 3,000+ campuses across 119 nations. 290+ campuses worldwide (just 9%) have been selected to host 4,000+ Millennium Fellows in 2023.

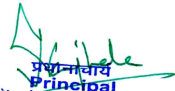
Congratulations! We are thrilled to share that you have been selected as a Millennium Fellow for the Class of 2023. The Admissions Committee was impressed by your application and those of others on your campus. This is a testament to your vision, leadership, and work. We see tremendous potential in what you can contribute to your cohort, the Fellowship, and the world at large, and in turn what you can gain to strengthen your leadership, your Fellowship Project, and the communities you care about. We look forward to engaging further with you.

This is a vital time to meaningfully engage to advance the Sustainable Development Goals, and we are grateful to have you in the Millennium Fellowship community.

Here are some important next steps. Please read the following carefully:

1. **Confirm your acceptance:** As soon as possible, take 10-15 minutes to confirm your acceptance to join the Millennium Fellowship Class of 2023 and create your Millennium Fellowship profile by filling out [this form](#).
2. **RSVP:** The Millennium Fellowship Class of 2023 Virtual Town Hall is scheduled to

5) Consulting Internship at Brands of Desire (BOD) Consulting


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धौला कुआँ, नई दिल्ली / Dhaula Kuan, New Delhi-21

bod

RELIEVING CUM INTERNSHIP CERTIFICATE

Date: 23rd Nov'22

To Whomsoever It May Concern

This is to confirm that **Mr. Divyam Chutani**, a student of **Sri Venkateswara College**, has successfully completed his Internship Training at "BOD," Conoron Creations Private Limited from **1st Sep '22 to 5th Nov'22**. During his internship, he worked in the field of **Consulting**.

All his dues till 5th Nov'22 with BOD have been cleared.

We found him very sincere, hardworking and fully devoted to his assignment.

We wish all success in his future career.



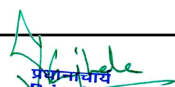
Ritika Sodhi
Senior Manager, HR Operations
Conoron Creations Pvt. Ltd.

New Delhi

Conoron Creations Private Limited
CIN No - U18101DL2008PTC182905

Corporate Office: Level 18, DLF Building No. 5, Tower A, Phase III, DLF Cyber City, Gurgaon, Haryana - 122002
Registered Address: B-5/6, First Floor, Rajouri Garden, New Delhi - 110027

6) CBRE Real Estate Internship Offer in Valuations & Advisory


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दिल्ली विश्वविद्यालय / University of Delhi
धौला कुआँ, नई दिल्ली / Dhaula Kuan, New Delhi-21



CBRE South Asia Pvt. Ltd.

7th Floor, DLF Square,
M Block, Jangpanda Marg,
DLF City Phase II,
Gurgaon - 122002.
T: 91 124 465 9700
F: 91 124 465 9800

www.cbre.co.in
newdelhi@cbre.co.in

CIN - U74140DL1999PTC100244

06-Nov-23

Name : Divyam Chutani

Address : J 30 A, Beri Wala Bagh, Hari Nagar, New Delhi - 110064

College : Sri Venkateswara College, Delhi

Letter of Intent for Internship

We are pleased to select you for Internship on a project based in **Gurugram** with our **VAS - Commercial** team starting from **16-Nov-23** to **16-Jan-24**.

You will be expected to submit your project report at the end of the project duration or as required by your supervisor.

We appreciate your time and wish you a great learning experience at CBRE.

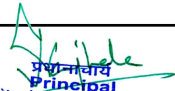
For CBRE South Asia Pvt. Ltd

Sachin Howal

General Manager – Human Resources

Regd. Office : PTI Building, Ground Floor, 4, Parliament Street, New Delhi - 110 001, India T: 91 11 4239 0200 F: 91 11 2331 7670

7) Operations Internship at TravClan


प्रधानाचार्य
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श्री वेङ्कटेश्वर महाविद्यालय
Sri Venkateswara College
दिल्ली विश्वविद्यालय / University of Delhi
धौला कुआँ, नई दिल्ली / Dhaula Kuan, New Delhi-21



Dear Divyam,

We are delighted to offer an internship opportunity to work as **Operations Intern** with TravClan Technology India Pvt. Ltd. ("Company"), starting from **26th February 2024** for 3 months as a part of your curriculum requirement.

Offer Details

Your stipend will be Rs. 15,000 per month.

Offer Conditions

The offer stands contingent on a background check and validation of the information provided by you during the interview or any other process related to your internship with the Company. The company reserves all right to cancel this offer letter if any relevant information provided by you is found false or misrepresenting.

By accepting this offer you are also confirming that

1. There are no contractual obligations or education requirements that would prevent you from delivering your responsibilities with the Company or taking up this internship with the Company.
2. You are not bringing any Intellectual Property that you do not have sole ownership of.

Note that the offer stands valid only if you join before or on the said date i.e. 26th February 2024, failing which the offer may lapse.

Looking forward to working with you and enabling you to reach your goals while creating the largest travel company in the world!

Thanks and excited,

Pronami Borah
People Operations Head



+91 977 339 7287



grow@travclan.com
www.travclan.com

श्री वेङ्कटेश्वर महाविद्यालय
Sri Venkateswara College
दिल्ली विश्वविद्यालय / University of Delhi
धौला कुआँ, नई दिल्ली / Dhaula Kuan, New Delhi-21

Date: 15 June 2024

Angel Soni
New Delhi

Dear Angel,

We are pleased to offer you an internship at Carillon Media in the role of Content Research Intern. We believe your skills and passion make you an excellent fit for our team, especially as we develop and enhance our Lurny platform.

Position: Content Research Intern
Start Date: 17 June 2024
Duration: 2 months
Hours: 45 hours per week
Location: Remote
Stipend: Rs 8,000 per month

Responsibilities:

Content Research and Analysis:

- Conduct thorough research on various subjects to gather relevant information for creating educational content.
- Analyze data and trends from multiple sources to ensure content accuracy and relevance.

Reporting:

- Prepare regular reports summarizing research findings, content performance, and user feedback.
- Present insights and recommendations to the content team and senior management to aid in decision-making.

User Engagement:

- Develop and implement strategies to enhance user engagement with the educational content.
- Explore and suggest innovative methods such as gamification and interactive elements to increase content retention.
- Monitor and report on the effectiveness of engagement strategies and make data-driven recommendations for improvement.

Feedback Collection:

- Assist in organizing and managing feedback sessions to understand user experiences and satisfaction with the content.
- Collect and document user feedback to identify areas for improvement in content delivery and engagement.
- Support the implementation of user feedback into content development processes.

Competitive Analysis:

- Research and analyze competitive products in the edtech space, focusing on content quality, presentation, and user engagement strategies.
- Provide detailed comparative analysis to identify strengths and weaknesses of competitors' offerings.
- Suggest strategic improvements to position our content effectively in the market

CARILLON

Mentorship and Learning Opportunities:

Throughout your internship, you will receive guidance and mentorship from experienced members of our team, providing you with valuable industry insights and enhancing your professional skills.

Please confirm your acceptance of this offer by signing and returning this letter by 17 June 2024. We are excited about the potential contributions you can make to Carillon Media and Project Lunny and look forward to welcoming you to our team.

Should you have any questions, feel free to contact me directly at krish@carillonmedia.com or WhatsApp. +91 7356529814 (Krishnesh) / +91 9767695823 (Sreerag)

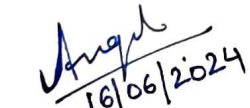
Thank you for considering this opportunity. We hope you are as enthusiastic about joining us as we are to have you on board!

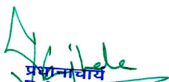
Sincerely,


Krishnesh Nair
Founder and CEO
Carillon Media



I accept the Internship Offer.


16/06/2024
Angel Soni


Principal
श्री वेंकटेश्वर महाविद्यालय
Sri Venkateswara College
दिल्ली विश्वविद्यालय / University of Delhi
घौला कुआँ, नई दिल्ली / Dhoola Kuan, New Delhi-21



AMWETA HEALTHTECH PRIVATE LIMITED

Ms. ANGEL SONI
RZ D-3 171-A, 2nd Floor, Gali no. 7,
Near Shemrock Public School,
Mahavir Enclave, Palam Village,
South West Delhi, Delhi – 110045

Re: Offer of Internship

Date: 23-02-2024

Dear ANGEL SONI,

We are pleased to extend an offer to you for an internship position at AMWETA HEALTHTECH PRIVATE LIMITED (MEDMORA), in the *Bloggers*, for the position of *Blog Writing*. We were impressed with your background and believe that you have the potential to make a positive contribution to our team.

The details of your internship offer are as follows:

1. **Start Date and Duration:** Your internship will commence on 23-02-2024 and is expected to complete on 24-03-2024, lasting for a period of **1 Months**.
2. **Working Hours and Location:** There is no Standard Working Hours it will only be limited to 5 Articles/Week or 20 Articles Per month.
3. **Reporting Manager:** You will be reporting to *Ankur Singh, Customer Success Acquisitor*.
4. **Stipend and Benefits:** You will receive a monthly stipend of Rs. 2000/- payable after completing the monthly Target. Please note this is a learning experience and the stipend is meant to assist with incidental expenses.).
5. **Responsibilities:** Your primary responsibilities will include *Blog Writing and w=any other changes required by the Managment*. We expect you to conduct yourself in a professional manner and adhere to company policies and procedures at all times.
6. **Learning Opportunities:** During the course of your internship, you will have the opportunity to *(describe the learning experiences, such as training programs, mentorship, etc.)*
7. **Confidentiality and Non-Disclosure:** As an intern, you will have access to sensitive and proprietary information. You are required to sign and adhere to the Confidentiality and Non-Disclosure Agreement, which will be provided separately.
8. **Evaluation and Feedback:** Your performance will be evaluated periodically. Constructive feedback will be provided to help you grow and make the most out of this opportunity.
9. **Employment Prospects:** This internship does not constitute a commitment of future employment. However, successful completion of the internship could be considered as a factor if you apply for a position within AMWETA HEALTHTECH PRIVATE LIMITED in the future.
10. **Termination:** Either party may terminate this internship by providing **15 Days** written notice.

[Signature]
Principal
श्री वेङ्कटेश्वर महाविद्यालय
Sri Venkateswara College
दिल्ली विश्वविद्यालय / University of Delhi
बीला कुआँ, नई दिल्ली / Dhula Kuan, New Delhi-21

Please confirm your acceptance of this offer by signing and returning a scanned copy of this letter within 7 days to hr@medmora.com.

We are excited about the possibility of you joining our team and look forward to a productive and successful internship.

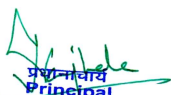
Sincerely,

Bhupendra Giri
HR
Amweta Healthtech Pvt Ltd

I, Angel Soni, acknowledge that I have read and understood the terms of this Internship Offer, and I accept the offer as outlined above.

Signed: Angel (signature)

Date: 23/03/2024


प्रधानाचार्य
Principal
श्री वेंकटेश्वर महाविद्यालय
Sri Venkateswara College
दिल्ली विश्वविद्यालय / University of Delhi
धौला कुआँ, नई दिल्ली / Dhoola Kuan, New Delhi-21



MARPU FOUNDATION

CERTIFICATE OF INTERNSHIP

Awarded With Applause To

Angel Soni

This internship certificate is presented to them to acknowledge their contribution to working with us as a " **Writing Intern** " in the social awareness wing from **15 January 2024** to **25 January 2024** at Marpu Foundation.



Manas
V. Manas Chandra

DIRECTOR | Operations



26th January 2024

DATE

Marpu Foundation

Charity ID: 619/19 (TS) & AAGTM4991A | 80G: HYD/80G/2020-21/A/10246

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Regarding JNMF Internship

Jahanvi Sodha <jahanvi.sodha@oiyo.in>

Wed, 3 Jul at 4:12 PM

Cc: Kavi Bhansali <kavi@oiyo.in>

Bcc: <ayushimishra0502@gmail.com>

Dear Students,

You have been shortlisted to begin the work for the JNMF Summer Internship from the month of July and August on the physical sets.

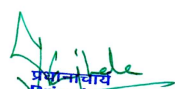
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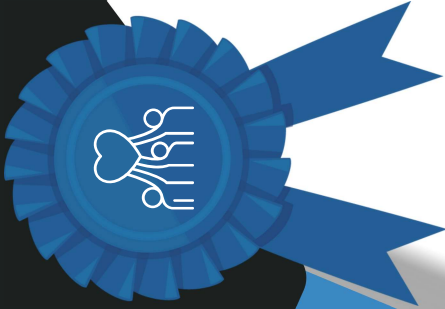
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<https://chat.whatsapp.com/JwoO5lvPH4g1WY6VRASTds>

Regards,
Jahanvi
9904273885


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Kashvi

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Ayushi Kumari

Your contribution to **CLOTHES DONATION DRIVE** in **VARANASI** on **27th JULY, 2024**, has been instrumental in aiding those in need. Thank you for consciously choosing to reuse your pre-loved items and contributing to a sustainable, mindful world.

Thanks for being our **#KashviKiKiran**

27 July, 2024

Social Impact Manager

Date of Issuance

Nikhil Gupta

Program Manager

Aditya Singh

Director

Ishan Dwivedi

@wearekashvi



CIN: U88900UP2023NPL191895



NAME : VANSHIKA VERMA

COURSE: BA (HONS.) HISTORY

ROLL NO. 0623036

YEAR: 2ND YEAR – 3RD SEMESTER

CORE: HISTORY OF MODERN CHINA (1840S TO 1950S)

FACULTY : MS. NUTI NAMITA MA'AM


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ASSIGNMENT ON .

"What caused the 1st Sino- British conflict in 1839 was not a few chests of Opium but inflexible trade relations between China and Britain"

Explain by discussing causes of 1st opium war.

Introduction:

THE FIRST OPIUM WAR_(1839-42)

The Opium Wars, as the name suggests, was a series of armed conflicts between Western powers and Imperial China in the mid 19th century apparently over the trade of opium. It saw the first time China engaged in a full-fledged war with Western nations, resulting in its defeat and the signing of treaty settlements which would be the beginning of what is known as China's 'century of humiliation'. But what is particularly complex and historically relevant in the story of China's Opium Wars is the way in which the conflict began. Historians have, over the years, questioned whether this title may be a misnomer as opium need not be considered the real cause of the conflict. It is pertinent to understand prevailing economic, social, religious and political conditions in China prior to the coming of the Western powers to Canton and how these two sets of value systems clashed within their relationship of trade. Moreover, it is essential to determine the extent to which Britain, the main western power involved, was the cause of the Opium Wars and whether China was also to blame in sparking off this conflict. This essay attempts to understand the Opium Wars through its causes and consequences, and looks to establish whether the wars were brought on by the British merchants or whether Chinese society of the time might have had something to do with it. Opium was a narcotic substance derived from the poppy flower. The Chinese called it ying-su or mi-nang or a-fu-yung or po-pi (poppy). It was chiefly used as medicine to relieve pain and reduce tension. However opium "smoking" began only after tobacco-smoking had spread to China from Formosa(Taiwan), under Dutch and Portuguese influence, in the 17th century. In the 1670s, this practice spread to 2 provinces in China – Fukein and Kwangtung. From then on, opium smoking rapidly became a common practice and soon attained the proportions of a national vice. Objections to its use were raised from an

early time. Emperor Yung-cheng prohibited the sale and smoking of opium in 1729, while Emperor Chia-ch'ing outlawed its importation and cultivation in 1796. Thus, after this, opium was a banned substance. In 1800 there was another stringent imperial edict for the same. This however did not really discourage the trade. Instead the whole opium traffic now became illicit. Officials were ordered to bring it to an end, but they found it too profitable as a source of "squeeze". Most of the opium came from India, some from Persia, and, towards the last, some Turkish opium was imported by the Americans. In 1729, the annual import of opium from India was 200 chests. In 1767, this increased to 1000 chests a year. From 1800 to 1821, the average was about 4500 chests a year, but the annual total grew to some 10,000 chests by 1830 and over 40,000 chests by 1838-39. (A chest usually contained 133 pounds.) By then, the balance of trade had become unfavourable to China and the value of opium imported alone exceeded that of all the commodities exported. The increase in importation was also indicative of an increasing number of users. By the late 1830s, official records mention that there were as many as 10 million addicts in China. In 1833, the British government abolished the monopoly of the East India Company over the China trade through the Second Charter Act. This led to a further increase in the activities of private traders, giving an immense boost to the already existing opium smuggling. New firms now entered the trade, such as Russell & Company, an American firm. The leading British private firm, Jardine, Matheson & Company handled roughly one-third of the total opium trade in China.

Repercussions , outbreak:

By the beginning of the 19th century, the situation became alarming. Opium addiction soon became widespread. The addicts in the early 19th century were mostly young men of rich families, but gradually the habit spread to people of other walks of life – government officials, merchants,

literati, women, servants, soldiers and even monks, nuns and priests. Their lifestyle suffered. Drug use thus threatened to undermine not only family morals, but also social and moral foundations of the empire. The spread of opium addiction can also be associated with the other trends already prevalent, e.g. population pressure and corruption in government. Opium also had a negative impact on Chinese society and economy. First, drug addiction affected the workforce and undermined production, thus opening the way for foreign imports to increase at the expense of China's domestic industries. Also, large areas which had earlier been used to grow food crops were now being planted with poppy in order to get the opium cheaper. A major part of the meagre income of an ordinary Chinese was spent on opium. It had been calculated that in 1839, 100 million taels were being spent each year by Chinese opium smokers. This caused a stagnation in the demand for other commodities, with a consequent general sluggishness in the market. Business slowed down, the standard of living fell and public services no longer worked smoothly. Another serious repercussion was the drain of silver, the basis of China's currency, beginning sometime after 1821. As opium imports increased, China for the first time began to suffer a net loss of silver, mainly taken out to India as bullion to pay for opium. British statistics indicate that the outflow of silver from China to Britain between 1823 and 1834 was worth 25.2 million dollars. This, along with other factors like counterfeiting, led to a fiscal crisis, causing fluctuations in the monetary system. The exchange rate between the copper cash used in everyday transactions and the silver bullion (in the unit of weight and fineness known as the tael) began to rise. Goods paid for in copper and taxes paid for in silver rose in price. Instead of 800 or 1000 cash to meet a statutory tax of one silver tael, which had been the usual rate for centuries, it began to take 1200 or even 2000 cash. This imposed hardship at all levels of society – peasants had to pay more as taxes, merchants charged more for their sales, official tax collectors meeting their quotas in silver had less copper cash left over as private squeeze and overall government revenue declined. To meet the economic crisis, the

government debased the copper coins and increased their annual minting. But the crisis continued. Opium smuggling, together with the activities of the foreign firms in Canton, also created a problem of authority that challenged the ability of the state to rule. Canton and other southeastern ports became centres of insubordination and corruption. These developments led to serious discussions between the Emperor and his officials on how to end the menace of opium smuggling. This gave rise to the 'Great Opium Debate of 1838'. There were two viewpoints on the steps to be taken to tackle the problem, as mentioned in the official records. Juan Yuan at Canton counseled a policy of compromise - to continue to oppose opium smoking but to make opium import official, subject to a tariff so as to raise revenue and discourage smuggling; and at the same time to prevent the outflow of silver by letting opium imports be purchased only by bartering Chinese goods, not silver. The pragmatic approach, advocated mainly by a high official called Hsu Nai-chi, also favoured the legalization of opium trade, in order to make its control possible. He also suggested that the ban on opium production be removed so that gradually China would become self-sufficient in opium, leading to a decline in the imports. However, a minority group, led by another senior official Huang Chuh Tzu, took a more hardline position. He argued for even stricter imposition of laws banning opium and thorough suppression of trade. In this, he appealed to the Emperor as a protector of the people, who had a duty to prevent what was harmful to the people. Eventually it was this view that prevailed and in 1839, an imperial statute in 39 articles levied extreme punishments (including death penalty) both for trading in and consumption of opium. The imperial government appointed a High Commissioner to Canton to suppress opium trade, Lin Tse-hsu (1785-1850). He arrived at Canton on March 10th 1839, and to the surprise of the foreign merchants, took immediate drastic action. He ordered them to hand over their opium stock and asked them to sign a bond agreeing not to deal in opium. It was not his aim to use force against the foreign traders, much less start a war with the British. But he soon found it necessary to coerce them

and for this purpose, on March 24, he confined about 350 foreigners in the Thirteen Factories. Lin released them only when the British merchants delivered their opium stocks (22,000 chests), which he then publicly destroyed. . The British now decided to use force to resolve matters. Hostilities began gradually in small affrays intermixed with negotiations. There were a series of skirmishes and the conflict developed into the First Opium War. It lasted from November 1839 to August 1842, when China was finally defeated and forced to sign the Treaty of Nanking.

Historiography and consequences:

Since then, the Opium War has been a topic of much academic controversy. The debate is essentially on two issues – whether the war was inevitable, regardless of opium; and whether onus for the war lies on the Chinese or the Western powers. while some call it the first Sino-British conflict, others call it the First Opium War. It should also be noted that the term ‘Opium War’ is not of Chinese origin. It was suggested by Sir Henry Pottinger, a British official. Old Chinese tradition shunned admission of defeat and till the 20th century, alluded to it as Yu-hsin (Foreign Provocation).

Cultural War Theory

John Quincy Adams, the 6th President of the United States, began the debate in December 1841, when he said that the cause of war was kowtow, “the arrogant and insupportable pretensions of China, that she will hold commercial intercourse...not upon equal reciprocity but upon the insulting and degrading forms of relation between lord and vassal”. W.A.P. Martin, a US missionary-scholar, modified this into a rationalized argument in his book, The Awakening of China, viewing the war as “the result of a series of collisions between the conservatism of the extreme orient and the progressive spirit of the western world”. According to this view, opium was not important for the British at all. The main concern was the unequal relations with the Chinese government. They were not pleased with their treatment as just another tribute-bearing nation and demanded

diplomatic equality. When the Chinese refused this demand, the British felt justified in going to war. Li Chien-nung called the war “a conflict of western and eastern cultures”, over 3 issues - international relations, commerce and foreign trade, and jurisdiction. This is similar to the views of a US scholar, E.H. Pritchard, who spoke of cultural difficulties over “the idea of equality”, the social status of the mercantile class, and “the different attitude towards justice”. Leslie Merchant sees the war as a doctrinal, philosophical clash between two cultures and two notions of government and society. John K. Fairbank ¹, in his earlier works, also expounded this theory, saying that Sino-centrism and the regressive judicial system were the causative factors in the conflict between a dynamic Britain trying to “civilize” a backward, stagnant China. This view has been criticized by Chinese communist historians. Tan Chung² says that wars cannot be fought merely on cultural grounds, which are subjective, physiological elements that never remain constant; there are always vested material interests. Also, he points out that the chances of a cultural clash, if any, were more probable when the Westerners had settled in Canton for the first time, rather than nearly 150 years later. Even after the war, no major cultural changes were witnessed in China. Moreover, the Chinese tributary system had already worn out itself to a large extent by the middle of the 18th century.

Trade War Theory

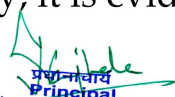
This theory argues after the Industrial Revolution, Britain was rapidly expanding and hence desired raw materials as well as newer markets for its manufactured goods. China resisted this. Victor Purcell concluded that it was the Industrial Revolution, the principle of unrestricted trade and the practice of free competition, which the Chinese did not accept, that

¹ John K. Fairbank- East Asia : The Modern Transformation

² Tan Chung- China And The Brave New World (A study of the origins of the opium war), 1840-42 ; Triton and Dragon : Studies On Nineteenth Century And Imperialism.

contributed to British frustration against China. Also, war was seen as a product of the “trade-obsessed” England's quest for “foreign markets”. Fairbank too agreed in his later works, saying that it was China's resistance to the long-term trading interest of the post-industrial trading society of Britain that made the war “unavoidable”, a case of Western expansion clashing with China's traditional order. For him, one of the fundamental causes of the Opium War “was the expansion of trade beyond the limits of the ancient Canton system of regulation”. These arguments consider the larger aim of the conflict to be the settlement of commercial relations with China on British terms. This view argues that opium was only a coincidental factor that led to the eventual war. Hsin-poa Chang said opium was a variable, which could have been substituted by any other commodity; he writes, “...had there been an effective alternative to opium, say molasses or rice, the conflict might have been called the Molasses War or the Rice War”. Opium was thus only an instrument of British commercial expansion. Vinacke called opium the occasion, and not the cause, of the war, which he explained by the conditions of Canton trade. Michael Greenburg also suggested that war could have been fought on any ‘x’ commodity. Some scholars have pointed out the flaws in this theory. Canton was a well-developed port and none of the restrictions hampered the conduct of trade. Moreover, while the system had monopolistic character, even on the British side the lucrative trade was a monopoly of the East India Company till 1833. It can also be argued that even in Britain, there had always been government measures to curb certain mercantile freedoms which were regarded as injurious to national interest. So the Chinese government must also be granted a similar right to defend its interest in whatever manner it considered best, including imposing restrictions on foreigners' activities on Chinese soil. Anyway, it is evident that by 1836, the Canton system had fallen apart.

Opium War Theory According to this view, Anglo-Chinese commerce was inevitable due to the addictive drug, opium and its serious repercussions on Chinese economy, society and polity. It has been propounded by


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scholars like S.W. Williams, Hu Sheng, Maurice Collins and Tan Chung³ himself. Westel Woodbury Willoughby, a US scholar, said there is overwhelming evidence that the war is justifiably called an Opium War. Tan Chung says that the cheap and abundant availability of opium in India and the huge profits accrued by British merchants in the trade helped to keep it alive. Opium was a commodity that would never reach a saturation point, unlike cotton. Also, the British needed no pretext to enter China for trade, since the Canton system was already weakening rapidly in the 1830s. That opium was called for to balance Britain's unfavourable trade vis-à-vis China was a myth created by the East India Company. He says that Britain had already achieved a balance of trade by introducing Indian cotton in China in the 1780s. So the British justification that opium was introduced to balance the trade cannot be accepted. The main issue then was to tilt this trade in Britain's favour. This could be, and was, achieved by opium alone, not any other commodity like rice or molasses. It was their obstinacy to continue this trade even after Chinese attempts to stop it that led to war. The theoretical weakness of this view has been questioned by Fairbank, who says that British interest in opium was only a recent addition to the long continued British desire for commercial expansion. Thus the theory fails to recognize the other important aspects of the conflict. As evidence, he points to the fact that opium trade was not legalized even after the war. Most of the clauses of the post-war treaties, in fact, served British commercial interests. To avoid further disgrace, Lin was replaced by Chi Ying and Illipu, who negotiated with the British representative, Sir Henry Pottinger, and signed the Treaty of Nanking on August 29, 1842, bringing an end to the war. According to its clauses, it imposed upon China an indemnity of 21 million taels - \$12 million for military expenses, \$6 million for the destroyed opium at Canton and \$3 million for the repayment of the

³ Tan Chung- China And The Brave New World (A study of the Opium Wars of the opium war), 1840-42 ; Triton and Dragon : Studies On Nineteenth Century And Imperialism.

hong merchants' debts to the British traders. It provided for the opening of 5 Chinese

ports – Canton, Amoy, Foochow, Ningpo, and Shanghai – to British traders to “reside and carry on trade”. They could also buy land and open schools. Consuls were to be appointed at each of ports. British residents were under their consul's legal jurisdiction, i.e., they had the right of extra-territoriality. The Chinese agreed to abolish the Cohong and to set up regulations for a uniform and moderate tariff on imports and exports, fixed at 5% ad valorem. Any change in duties would be by mutual agreement. It also provided for the cession to England of the island of Hong Kong. However the treaty did not deal with the issue which the Chinese considered to be of greatest importance – the question of opium trade. This treaty was the first in a series of treaties which opened China to the Western world and established the ‘treaty-port system’. However, this view can be critiqued by pointing out the immediate cause of war was the Manchu government’s attempt to suppress opium traffic. Secondly, the absence of opium in the Treaty was because of the stubborn resistance of the Manchus. In any case, the British government had always officially dissociated itself from the opium trade. In fact, the volume of smuggled opium continued to increase after 1842. It becomes obvious then, that the role of ‘Opium’ in the War cannot be underplayed. Its impact however, at the same time, cannot be judged through an exaggeratedly qualified lens of analysis. It would have been apt to designate the War with a title that has a particular connotation if we had found ourselves in any of the following situations. First, if there had been a complete absence of any evidence regarding the background to the War, and thereby leaving the entire discourse prone to historical speculation. Second, if there had been evidence conforming to any particular historiographical perspective with a simultaneous absence or apparent opposition to other scholarly understandings. Fortunately, we are not witnessing either of these situations remarkable for their narrow scope employable to determine history. While Confucianism continued to effect Chinese way of life till recently, the Industrial Revolution also had

compelled Britain to seek free markets overseas. This, coupled with the immediate impact of the catalyst 'Opium', something that neither molasses nor rice would have ever had of their own accord, led to the War. Therefore, it seems plausible to call it 'the First Opium War' so long as the choice behind this terminology is based on the most immediate cause. If it's necessary to take the long term picture into account, it should be more appropriate to use the title 'the Anglo-Chinese War of 1839'.

References:

John K. Fairbank, Edwin O. Reichauer And Albert M. Craig – East Asia: The Modern Transformation

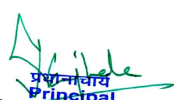
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3. Immanuel C. Y. Hsu – The Rise Of Modern China

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6. The War Of The Poppies – Leslie Marchant


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University of Delhi

Certificate of Internship

The Admission Branch, University of Delhi acknowledges the commitment, tireless effort and invaluable contribution of **Mr Karan Dwivedi** of **Sri Venkateswara College**, University of Delhi as an Admission Support Intern under the **Vice-Chancellor Internship Scheme** at Admission Branch, University of Delhi during the month of June - September 2023.

We wish him all the best in his future endeavours.

Professor Haneet Gandhi
Dean, Admission

Dr Vikas Gupta
Registrar

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Jaharvi Sodha 3 Jul



to Kavi, bcc: me ▾

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Robin Hood Army



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Regarding JNMF Internship

Inbox



Jaharvi Sodha Jul 3

to Kavi, bcc: me



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<https://chat.whatsapp.com/JwoO5lvPH4g1WY6VRASTds>

Regards,
Jaharvi
9904273885





THANK YOU

ZAARA SHARMA

for contributing to the cause of Letters for Change. It's been an amazing journey of two months. We are extremely happy to certify that you have completed the internship at Letters for Change as the Corporate Relations Manager under the domain of Corporate Relations.

May 22, 2024

Date of
Completion

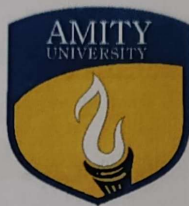

Anshu Mishra
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NTCC Report On

**“ROOT EXUDATES AND ENDOPHYTE-ASSISTED
BIOREMEDIATION OF PHENANTHRENE AND THEIR
IMPACT ON GROWTH AND DEVELOPMENT OF PLANT”**

Submitted to



Amity University, Uttar Pradesh

In partial fulfillment of the requirements for the award
of the degree of M.Sc. Biotechnology

By

CHESHTA VARSHNEY

Under the guidance of Dr. Ajay Kumar

AMITY INSTITUTE OF BIOTECHNOLOGY

BIOSCIENCES AND BIOTECHNOLOGY DOMAIN

AMITY UNIVERSITY, UTTAR PRADESH

Signature of the NTCC Convenor

प्रधानाचार्य
Principal
श्री वेङ्कटेश्वर महाविद्यालय
Sri Venkateswara College
दिल्ली विश्वविद्यालय / University of Delhi
धौला कुआँ, नई दिल्ली / Dhaula Kuan, New Delhi-21



Sri Venkateswara College

(University of Delhi)

Benito Juarez Marg, Dhaula Kuan, New Delhi- 110021

Phone Off: 24112196; Telefax: 011-24118535

Animal Plant Interactions Lab

Certificate of Training

This is to certify that **Ms. Apeksha Singhal** has successfully completed four months training in the project titled "**Biochemical characterization and bioactivity of plant-associated endophytic microbes**" from June 2023 to October 2023, in Animal Plant Interactions Lab under my guidance. During this tenure, she has become well versed with different microbial culture techniques and biochemical assays.

In addition, she has hands-on experience on the evaluating Antioxidant, Anti-arthritis potential of microbial cell free extracts prepared from endophytes isolated from *Brassica juncea*. She has also tested glucosinolates, phytohormones, phytochemicals, anti-microbial, proteolytic, lipolytic and amylolytic properties in cell free extracts.

Ms. Apeksha is very hardworking, meticulous and good at both planning as well as executing experiments. Her good writing skills and excellent conceptual knowledge makes her a promising research student. I have observed that she performs efficiently in both individual as well as team-based tasks. I wish her all the best for the future.

Prof. Vartika Mathur

DR. VARTIKA MATHUR
Professor
Department of Zoology
Sri Venkateswara College
University of Delhi, New Delhi

Received
Apeksha
12.02.24

प्रधानाचार्य
Principal
श्री वेंकटेश्वर महाविद्यालय
Sri Venkateswara College
दिल्ली विश्वविद्यालय / University of Delhi
घौला कुआँ, नई दिल्ली / Dhaula Kuan, New Delhi-21

Fwd: Application for Research Internship Inbox x



Richa Mullick

to me

5:45 PM (12 minutes ago)



----- Forwarded message -----

From: **Richa Mullick** <richam1303@gmail.com>

Date: Wed, 28 Jun 2023 at 12:50

Subject: Application for Research Internship

To: vmathur@svc.ac.in <vmathur@svc.ac.in>

Respected Dr. Vartika Mathur Ma'am,

I Richa Mullick, pursued my post graduation in MSc. Zoology from the Department of Zoology, University of Delhi (Academic Session: 2020-2022) is willing to do summer research training internship in your area of specialization-Insect Plant Microbe Interaction and Environment Management.

I am personally greatly inclined and interested in studying ecology involved in plant resistance and interaction of plants with pathogens and microbes.

Therefore I'm looking forward to interning under you as it would help in gaining immense real world knowledge on insect and plant interactions moreover consolidate my future career in research prospects.

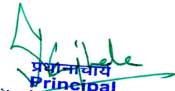
I am submitting my resume for your consideration.

Looking forward for your positive response,

Yours Sincerely,
Richa Mullick

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धौला कुआँ, नई दिल्ली / Dhaula Kuan, New Delhi-21

----- Forwarded message -----

From: <ankita.singh.26499@gmail.com>

Date: Thu, 7 Dec 2023, 12:52

Subject: Requesting for Dissertation opportunity

To: <vmathur@svc.ac.in>

Dear Sir/Ma'am,

I hope this email finds you well.

My name is Ankita Singh, and I am currently pursuing my **master's degree in microbiology** at **Amity Institute of Microbial Technology, Amity University, Noida, Uttar Pradesh**. I am writing to express my strong interest in conducting my four to five months research dissertation in your lab under your kind guidance.

My coursework has equipped me with a solid foundation in subjects such as **Molecular Biology, Virology, Drug Discovery & Development, Bacteriology, Medical Microbiology, Clinical Microbiology, Microbial Physiology & Development, Food & Industrial Microbiology, Biochemistry, Nanobiotechnology and Genetic Engineering**.

I have attached my CV, demonstrating my commitment to conducting rigorous research in your areas of expertise.

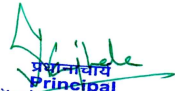
Thank you for considering my request. I am excited about the possibility of contributing to the advancement of knowledge in this field under your mentorship. Your guidance would be a valuable asset to my academic and professional growth.

Sincerely,

Ankita Singh
7461050580

One attachment • Scanned by Gmail ⓘ

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धौला कुआँ, नई दिल्ली / Dhaula Kuan, New Delhi-21

Certificate No. CDE/DSE/AB_01



Research Project
**"Finding of the Short-term Empirical Project on the Evaluative
Study of Ayushman Bharat in Rural Haryana"**

Sponsored by
Indian Council of Social Science Research, New Delhi

Under
**CENTRE FOR DEVELOPMENT ECONOMICS (CDE), DELHI SCHOOL OF ECONOMICS (DSE)
UNIVERSITY OF DELHI**

Certificate of Appreciation

This is to certify that Mr. Ayush Yadav, s/o Mr. Kamal Kumar, a student of Sri Venkateshwara College, University of Delhi, has successfully completed a one-week Internship from 24th December 2023 to 30th December 2023 involving data entry for the research project titled **"Finding of the Short-term Empirical Project on the Evaluative Study of Ayushman Bharat in Rural Haryana"** under Centre For Development Economics (CDE) at Delhi School of Economics (DSE), University of Delhi.

Your commitment, enthusiasm, and hard work throughout the internship have been commendable. Best wishes for your future endeavors!

**Dr. Devesh Birwal
PROJECT DIRECTOR**

Principal
श्री वेकटेश्वर महाविद्यालय
Sri Venkateswara College
दिल्ली विश्वविद्यालय / University of Delhi
धौला कुआँ, नई दिल्ली / Dhaula Kuan, New Delhi-21



प्रो० पंकज अरोड़ा
Prof. Pankaj Arora
अधिष्ठाता, छात्र कल्याण
Dean Students' Welfare

अधिष्ठाता, छात्र कल्याणकार्यालय
Dean Students' Welfare Office
दिल्लीविश्वविद्यालय, दिल्ली-110007
University of Delhi, Delhi-110007

Dated: 03.11.2023

Vice Chancellor Internship Scheme (Part-Time) 2023-24
Orientation cum Induction Programme

Please find below the list of selected candidates (based on their SGPA and performance in GD) for Vice Chancellor Internship Programme (Part-time). The Selected candidates are invited to an Orientation Cum Induction Programme as per the following schedule:

DAY	TIME
November 6, 2023 (Monday)	2:00 pm

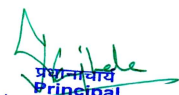
The venue for Orientation Cum Induction Programme is the office of the Dean Students' Welfare (DSW), Conference Centre (Near Gate No.4), University of Delhi.

The offices will be allotted to the interns during the Orientation Cum Induction Programme.

Interns must join the allotted office by November 7, 2023 without fail.

Sd/-

Dean Students' Welfare


प्रधानाचार्य
Principal
श्री वेंकटेश्वर महाविद्यालय
Sri Venkateswara College
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श्री वेंकटेश्वर महाविद्यालय
Sri Venkateswara College

(दिल्ली विश्वविद्यालय) (University of Delhi)
NAAC A⁺ Accredited

Benito Juarez Road, Dhaula Kuan, New Delhi-110021

Ph : 011-24112196, 24118590

principal@svcl.ac.in

Sri Venkateswara College
University of Delhi

Date: 05.06.2024

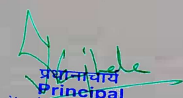
'STUDENT CENTERED NON-FUNDED RESEARCH PROJECT'

Certificate of Participation

This is to certify that Mr./Ms. Harsh Kumar Rai pursuing B.Sc. (Hons.) Biological Science has participated in the project titled "Preliminary Cytological Study in Selected Croton Variety: *Codiaeum variegatum* (L.) Blume" growing in the Campus of Sri Venkateswara College, New Delhi from September 5, 2023 to March 5, 2024 under the mentorship of Dr. Madhu Raina, Assistant Professor, Department of Botany, Sri Venkateswara College, University of Delhi.


Dr. Madhu Raina 5.6.24
MENTOR


Prof. V. Ravi
PRINCIPAL


प्रधानाचार्य
Principal
श्री वेंकटेश्वर महाविद्यालय
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धौला कुआँ, नई दिल्ली / Dhaula Kuan, New Delhi-21



Professor Sneha Sudha Komath

School of Life Sciences
Jawaharlal Nehru University
New Delhi- 110 067
Email: sskomath@mail.jnu.ac.in
Phone: +91-11-2670 4502
07 August 2023

CERTIFICATE OF EXPERIENCE

This is to certify that Ms. Muskan Aggarwal from Sri Venkateswara College, University of Delhi, worked as a summer trainee in my lab at the School of Life Sciences, Jawaharlal Nehru University, New Delhi, between 02.06.2023 and 19.07.2023. During this period, she had hands-on training in several molecular biology lab techniques including plasmid isolation from *E. coli*, gene cloning, PCR, colony-PCR, restriction digestion, agarose gel electrophoresis and transformations of *Candida albicans* cells. In the course of her work she also learnt several routine laboratory techniques such as centrifugation, autoclaving and preparation of different kinds of media and buffers.

Ms. Muskan Aggarwal was completely focused and involved with her project. She is a quick and enthusiastic learner and has excellent experimental hands. I wish her the very best.

Sneha Sudha Komath

प्रधानाचार्य
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KAUTILYA INDUSTRIES PVT. LTD.

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190, Udyog Vihar, Phase-I, Gurugram-122016, Haryana, India
Phone : 0124-4001238, E-Mail : sidharth@kautilyaipl.com
CIN : U74899DL1977PTC008688, www.kautilyaipl.com

To Whom It May Concern

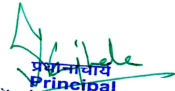
Dated. 010/11//2023

This is to certify that Mr Yash Tyagi S/O Sh Raj Tyagi has fruitfully completed his management course from 4Th Aug 2023 to 4th Nov 2023 with this organization. During the course we found him very punctual, dedicated, honest and laborious.

We wish him ever success in her life.

For Kautilya Industries Pvt.Ltd

Manager


Principal
श्री वेङ्कटेश्वर महाविद्यालय
Sri Venkateswara College
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THE INVESTOR CO.

CERTIFICATE OF COMPLETION

THIS CERTIFICATE IS AWARDED TO

YASH TYAGI

for successful completion of their Internship at **The Investor Co.** as a
Stock Market Analyst Intern from 05/05/2023 to 04/08/2023. We
appreciate their contribution and execution of the tasks with utmost
sincerity and diligence.

RAKSHAT GOYAL
Founder and
CEO

प्रधानाचार्य
Principal
श्री वेङ्कटेश्वर महाविद्यालय
Sri Venkateswara College
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श्री वेङ्कटेश्वर कलाशाला
श्री वेङ्कटेश्वर महाविद्यालय
Sri Venkateswara College

(दिल्ली विश्वविद्यालय) (University of Delhi)

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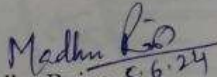
Sri Venkateswara College
University of Delhi

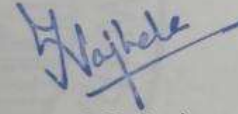
Date: 05.06.2024

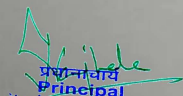
'STUDENT CENTERED NON-FUNDED RESEARCH PROJECT'

Certificate of Participation

This is to certify that **Mr./Ms. Yash Tyagi** pursuing **B.Sc. (Hons.) Biological Science** has participated in the project titled "Preliminary Cytological Study in Selected Croton Variety: *Codiaeum variegatum* (L.) Blume" growing in the Campus of Sri Venkateswara College, New Delhi from **September 5, 2023 to March 5, 2024** under the mentorship of **Dr. Madhu Raina**, Assistant Professor, Department of Botany, Sri Venkateswara College, University of Delhi.


Dr. Madhu Raina 5.6.24
MENTOR


Prof. V. Ravi
PRINCIPAL


प्रधानाचार्य
Principal
श्री वेङ्कटेश्वर महाविद्यालय
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धौला कुआँ, नई दिल्ली / Dhaula Kuan, New Delhi-21



CSIR Integrated Skill Initiative

Certificate course on Pathological Tools & Techniques for Biomedical Applications

Ref.: CSIR-CDRI/PTT/2239

Date: 31/07/2024

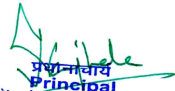
This is to certify that **Fatima Ansari**, Registration No. CSIR-CDRI/PTT/2239
Aadhaar No. 328241260001 has successfully completed six weeks certificate course on
Pathological Tools & Techniques for Biomedical Applications
from 19th June, 2024 to 31st July, 2024 under Skill Development Program at
CSIR- Central Drug Research Institute, Lucknow.


Dr. Madhav N. Mugale
Course Coordinator


Dr. Radha Rangarajan
Director


Dr. Sanjeev Kumar Shukla
Program Coordinator


CSIR-CENTRAL DRUG RESEARCH INSTITUTE, LUCKNOW
Jankipuram Extension, Sitapur Road, Lucknow- 226031 (India)


प्रधानाचार्य
Principal
श्री वेङ्कटेश्वर महाविद्यालय
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दिल्ली विश्वविद्यालय / University of Delhi
धौला कुआँ, नई दिल्ली / Dhaula Kuan, New Delhi-21



प्रो० पंकज अरोड़ा
Prof. Pankaj Arora
अधिष्ठाता, छात्र कल्याण
Dean Students' Welfare

अधिष्ठाता, छात्र कल्याणकार्यालय
Dean Students' Welfare Office
दिल्लीविश्वविद्यालय, दिल्ली-110007
University of Delhi, Delhi-110007

Dated: 03.11.2023

Vice Chancellor Internship Scheme (Part-Time) 2023-24
Orientation cum Induction Programme

Please find below the list of selected candidates (based on their SGPA and performance in GD) for Vice Chancellor Internship Programme (Part-time). The Selected candidates are invited to an Orientation Cum Induction Programme as per the following schedule:

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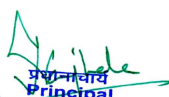
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The offices will be allotted to the interns during the Orientation Cum Induction Programme.

Interns must join the allotted office by November 7, 2023 without fail.

Sd/-

Dean Students' Welfare


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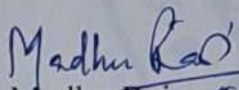
Sri Venkateswara College
University of Delhi

Date: 05.06.2024

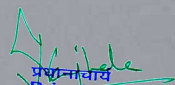
'STUDENT CENTERED NON-FUNDED RESEARCH PROJECT'

Certificate of Participation

This is to certify that Mr./Ms. Arshdeep Kaur pursuing **B.Sc. (Hons.) Biological Science** has participated in the project titled "Preliminary Cytological Study in Selected Croton Variety: *Codiaeum variegatum* (L.) Blume" growing in the Campus of Sri Venkateswara College, New Delhi from **September 5, 2023 to March 5, 2024** under the mentorship of **Dr. Madhu Raina**, Assistant Professor, Department of Botany, Sri Venkateswara College, University of Delhi.


Dr. Madhu Raina 5.6.24
MENTOR


Prof. V. Ravi
PRINCIPAL


प्रधानाचार्य
Principal
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Sri Venkateswara College
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धौला कुआँ, नई दिल्ली / Dhaula Kuan, New Delhi-21

CERTIFICATE

OF HOURS

ADITI GAUR

This is to certify that Aditi has dedicated a total of 6 hours to STEM Today, contributing significantly to our mission of making STEM education accessible, comprehensive, and engaging for youth. Aditi's primary responsibilities as Researcher included reading research articles, dissecting their content, and translating them into a format that would be engaging and educational for other teens.



March 4, 2024



श्री वेङ्कटेश्वर महाविद्यालय
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दिल्ली विश्वविद्यालय / University of Delhi
धौला कुशी / Daula Kushi, New Delhi-110021

Audrey Chan

Audrey Chan

Executive Director

David Ordonez

David Ordonez

Executive Director



SRI VENKATESWARA COLLEGE

University of Delhi

NAAC A+

CERTIFICATE OF COMPLETION

This is to certify that **Mehak Hira ,B.Sc. (H) Biological Sciences** of **Sri Venkateswara College**, has successfully completed the Add-on Course and final assessment on **"Introduction to Drug Design And Drug Development -1 (Your Ladder to Pharma Industry!!!)"** organised by the college during March, 2023 -June, 2023.

Prof. Sharda Pasricha
Coordinator

Dr. Nimisha Sinha
Coordinator

Prof. C. Sheela Reddy
Principal

प्रधानाचार्य
Principal
श्री वेङ्कटेश्वर महाविद्यालय
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धौला कुआँ, नई दिल्ली / Dhaula Kuan, New Delhi-21

University of Delhi

List of Selected Candidates for Vice Chancellor Internship Scheme (Part-Time) 2023

S.No	Token No.	Name of the Applicant	Sem.	UG/PG Courses	College/Department/Centre	Contact No.	Email ID
1	1	A Sharanika	V	B.A Program	Miranda House	7093****17	shar****@gmail.com
2	58	Aastha	III	B.A Program	Miranda House	9368****60	aast****@gmail.com
3	59	Aastha Agrawal	III	BBA (FIA)	Shaheed Rajguru College of Applied	9905****42	miss****@gmail.com
4	140	Adarsh Singh	III	B.A Program	Hans Raj College	9451****82	unso****@gmail.com
5	141	Adarsh Upadhyay	III	B.Sc. (Hons.) Zoology	Ramjas College	6263****20	uada****@gmail.com
6	145	Adithya Nambiar	V	B.Sc (Hons.) Biomedical Science	Bhaskaracharya College of Applied	8468****40	adit****@gmail.com
7	164	Aditya Anand	III	B.A. (Hons.) History	Kirori Mal College	8603****08	anan****@gmail.com
8	209	Akanksha Dubey	III	B.Sc. (Hons.) Mathematics	Miranda House	8249****56	akan****ouse.ac.in
9	244	Akshat Chauhan	III	B.Sc (Hons.) Biomedical Science	Bhaskaracharya College of Applied	9971****80	chau****@gmail.com
10	300	Ambuj Gupta	III	B.A Program	Bhim Rao Ambedkar College	9717****63	ambu****@gmail.com
11	338	Ananya Panwar	III	B.A. (Hons.) English	Hindu College	9137****75	anan****@gmail.com
12	396	Anju Sharma	III	B.A. (Hons.) Political Science	Kirori Mal College	9352****05	anju****@gmail.com
13	450	Anshika Patel	V	B.Sc. (Hons.) Botany	Hans Raj College	8234****14	pate****@gmail.com
14	452	Anshika Sharma	V	B.Sc. (Hons.) Zoology	Acharya Narendra Dev College	8273****75	ansh****@gmail.com
15	458	Anshu Raj	III	B.Sc. (Hons.) Physics	St. Stephen's College	8920****86	ansh****@gmail.com
16	498	Anushka Sahu	III	B.Sc. (Hons.) Chemistry	Miranda House	8854****33	anus****@gmail.com
17	582	Aryan Gupta	III	B.Sc. Programme Physical Sciences	Sri Guru Tegh Bahadur Khalsa College	9354****45	gupt****@gmail.com
18	596	Arzoo Gera	V	B.Sc. (Hons.) Mathematics	Dyal Singh College	7011****72	arzo****@gmail.com
19	601	Ashish Agrawal	III	B.Sc. (Hons.) Mathematics	Hindu College	8429****57	ashi****@gmail.com
20	611	Ashita Singh Khasa	V	B.Sc. (Hons.) Microbiology	Ram Lal Anand College	9896****78	ashi****a.du.ac.in
21	618	Ashutosh Kumar	III	B.Sc. (Hons.) Zoology	Sri Venkateswara College	6299****99	2022****c.du.ac.in
22	630	Asmi Goel	III	B.Sc.(Hons.) Statistics	Ramjas College	8377****52	asmi****@gmail.com
23	667	Ayush Maan	III	B.A Program	Sri Venkateswara College	8266****02	ayus****@gmail.com
24	669	Ayush Sharma	III	Bachelors in Management Studies	Ram Lal Anand College	7988****13	ayus****a.du.ac.in
25	709	Bhavika Gupta	V	B.Com (Hons.)	Ram Lal Anand College	8168****14	bhav****a.du.ac.in
26	716	Bhavya Tayal	V	B.Sc. (Hons.) Food Technology	Institute of Home Economics	9911****00	bhvt****@gmail.com
27	759	Chetan Kumar Sahu	III	B.A. (Hons.) Geography	Kirori Mal College	7805****12	mist****@gmail.com

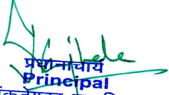
28	845	Devanshu Lalwani	V	B.Sc. (Hons.) Chemistry	St. Stephen's College	9509****24	deva****@gmail.com
29	867	Dhruv Kashyap	III	Five Year Integrated Program in	Delhi School of Journalism	7992****87	kash****@gmail.com
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32	900	Divya Deo	III	B.A. (Hons.) English	Daulat Ram College	9341****37	deod****@gmail.com
33	908	Divya Sharma	III	B.Sc. Prog. Life Science	Sri Venkateswara College	8800****98	divy****@gmail.com
34	980	Garvit Garg	V	B.Sc. (Hons.) Mathematics	Hindu College	9058****20	garg****@gmail.com
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44	1200	Jagdish Kumar	III	B.Sc. Programme Physical Sciences	Atma Ram Sanatan Dharma College	7889****39	2451****d.du.ac.in
45	1210	Jasbina Quadri	III	B.Sc. (Hons.) Mathematics	Miranda House	8233****26	jasb****ouse.ac.in
46	1228	Jayant Kumar	III	Five Year Integrated Program in	Delhi School of Journalism	8595****14	jaya****@gmail.com
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48	1292	Kalpana Sharma	III	B.Com (Hons.)	Kirori Mal College	9559****64	shar****@gmail.com
49	1385	Khushi	III	Five Year Integrated Program in	Delhi School of Journalism	7678****68	khus****@gmail.com
50	1391	Khushi Chaudhary	III	B.Sc. Programme Physical Sciences	Bhagini Nivedita College	9557****79	khus****@gmail.com
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74	1830	Nandini Singh	III	B.A. (Hons.) History	Miranda House	8864****24	nand****ouse.ac.in
75	1849	Navneet Nayan	III	B.Sc. Prog. Life Science	Ramjas College	9057****06	navn****@gmail.com
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79	2037	Prabhat Mishra	III	B.Sc. (Hons.) Electronic Science	Sri Guru Tegh Bahadur Khalsa College	9310****99	mish****@gmail.com
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82	2163	Priya Dixit	V	B.Sc. (Hons.) Home Science	Institute of Home Economics	9211****57	priy****e.du.ac.in
83	2167	Priya Sharma	III	B.A. (Hons.) History	Kalindi College for Women	9265****48	psha****@gmail.com
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105	2753	Shivkumari Meena	V	B.A Program	Miranda House	8815****66	SHIV****ouse.ac.in
106	2758	Shraddha Varshney	III	B.Sc. Prog. Life Science	Daulat Ram College	8791****24	ls22****r.du.ac.in
107	2762	Shreeya Ahuja	III	B.Com	Kirori Mal College	7683****04	shre****@gmail.com
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109	2783	Shreyansh Shukla	III	B.Sc. Programme Physical Sciences	Atma Ram Sanatan Dharma College	8922****15	shre****@gmail.com
110	2813	Shruti Mishra	III	B.Sc. (Hons.) Biological Sciences	Sri Venkateswara College	6362****92	Shru****@gmail.com
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115	2900	Sneha Singh	III	B.Com	Shyama Prasad Mukherji College for	8423****85	ratn****@gmail.com
116	2902	Snehal Sinha	V	B.A. (Hons.) Political Science	Shyam Lal College (Evening)	9431****40	sneh****@gmail.com
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129	3080	Tanvir Kaur Saran	V	B.Sc. (Hons.) Physics	Miranda House	9779****07	tanv****@gmail.com
130	3088	Tarun Arjariya	V	B.Sc. (Hons.) Chemistry	Ramjas College	9956****81	taru****@gmail.com
131	3113	Twinkle Sharma	III	B.Sc. (Hons.) Mathematics	Gargi College	9149****18	star****@gmail.com
132	3116	Uday Raj Singh	III	B.Com	Sri Guru Tegh Bahadur Khalsa College	7481****92	uday****@gmail.com
133	3127	Ujjwal Mittal	III	B.Sc.(Hons.) Statistics	Kirori Mal College	9810****94	ujj.****@gmail.com
134	3166	Vaibhav Singh	III	B.Sc. (Hons.) Mathematics	Ramanujan College	9027****39	vaib****@gmail.com
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136	3201	Vanshika Gupta	III	B.A. (Hons.) Philosophy	Daulat Ram College	8825****11	phil****r.du.ac.in
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140	3312	Vrinda Tyagi	III	B.A. (Hons.) Psychology	Daulat Ram College	9810****09	vrin****@gmail.com

Declaration of Result: Nov. 3, 2023


 प्रधानाचार्य
 Principal
 श्री वेंकटेश्वर महाविद्यालय
 Sri Venkateswara College
 दिल्ली विश्वविद्यालय / University of Delhi
 धौला कुआँ, नई दिल्ली / Dhola Kuan, New Delhi-21



REYES 2024: You have been selected to participate as a member of project #15

1 message

Daniel Martín Gallego Cheno <A00833304@tec.mx> Wed, Jun 26, 2024 at 5:02 AM

To: 100mharshitiwari@gmail.com <100mharshitiwari@gmail.com>, che22v.padhy@stuiocb.ictmumbai.edu.in <che22v.padhy@stuiocb.ictmumbai.edu.in>, u22me215@med.svnit.ac.in <u22me215@med.svnit.ac.in>, nguyli01@gettysburg.edu <nguyli01@gettysburg.edu>, rubeshvetri121@gmail.com <rubeshvetri121@gmail.com>, spinetti.mdu@gmail.com <spinetti.mdu@gmail.com>, hhpfeil@ualberta.ca <hhpfeil@ualberta.ca>, adelina.baerligea@tum.de <adelina.baerligea@tum.de>, wl.tsai.2022@gmail.com <wl.tsai.2022@gmail.com>, mafaldaxapelli@gmail.com <mafaldaxapelli@gmail.com>, kathanshah405@gmail.com <kathanshah405@gmail.com>, sahashransu.2016@gmail.com <sahashransu.2016@gmail.com>, singu280805@gmail.com <singu280805@gmail.com>, gabrielaitzel.duartemaya@gmail.com <gabrielaitzel.duartemaya@gmail.com>, sophiathegem@gmail.com <sophiathegem@gmail.com>, bhavana.gudnavar_ug25@ashoka.edu.in <bhavana.gudnavar_ug25@ashoka.edu.in>, 220.pranavjohar@gmail.com <220.pranavjohar@gmail.com>, sara.soto@upr.edu <sara.soto@upr.edu>, karina.clemente.r@uni.pe <karina.clemente.r@uni.pe>, biswajoype.stud@nita.ac.in <biswajoype.stud@nita.ac.in>, mantavy.t@gmail.com <mantavy.t@gmail.com>, aditya_ratnaparkhi@yahoo.com <aditya_ratnaparkhi@yahoo.com>, meyyappankict@gmail.com <meyyappankict@gmail.com>, ncjinendra@gmail.com <ncjinendra@gmail.com>, shreya28001@gmail.com <shreya28001@gmail.com>, mohamedalazab112@gmail.com <mohamedalazab112@gmail.com>, nancy.23boe10120@vitbhopal.ac.in <nancy.23boe10120@vitbhopal.ac.in>, joelluevano95@gmail.com <joelluevano95@gmail.com>, verma.satyam.venky@gmail.com <verma.satyam.venky@gmail.com>, sambhav.antrikshaa@gmail.com <sambhav.antrikshaa@gmail.com>, work0priyanshu@gmail.com <work0priyanshu@gmail.com>, amityadav97268@gmail.com <amityadav97268@gmail.com>, harshasah5@gmail.com <harshasah5@gmail.com>, antony.echem@gmail.com <antony.echem@gmail.com>

Cc: Omar Israel González Peña <ogonzalez.pena@gmail.com>

Dear students,

You have been selected to participate as member of the project #15 "*Systematic Literature Review of Circular Economy associated to energetic industry, electronic waste, and education*".

Your mentor is Dr. Omar Gonzalez from Tecnologico de Monterrey.

Desired outcome of project: Literature review, Shadowing experience
Duration of the project: More than 8 weeks [beyond the REYES time period]
Project Description: Conduct all stages of a SLR covering the intersection of the topics of circular economy, energetic industry, electronic waste, and education. Develop research questions and conduct a search for articles on scientific databases. Capture relevant information from articles via the research questions, analyze insights, and collaborate on writing the review article.

First of all, it is mandatory to fill out this form so that the selected students who are **really interested** **CONFIRM THEIR COMMITMENT** to this project: <https://forms.gle/GnNwCeFGbxtfdiaY8>

We are still preparing the final details. Please complete this Google form and wait until next Monday as you will receive the following instructions as well as the schedule of the welcome meeting and also the schedule of the following weekly meetings.

Best,
Daniel

Project 15 Title: *Systematic Literature Review of Circular Economy associated to energetic industry, electronic waste, and education*

Mentor: Omar Gonzalez and Daniel Gallego

Desired outcome of project: Literature review, Shadowing experience

Duration of the project: More than 8 weeks [beyond the REYES time period]

Project Description: Conduct all stages of a SLR covering the intersection of the topics of circular economy, energetic industry, electronic waste, and education. Develop research questions and conduct a search for articles on scientific databases. Capture relevant information from articles via the research questions, analyze insights, and collaborate on writing the review article.

You have been selected to participate as a member of project #15 with Dr. Omar Gonzalez. If you received this Google Form and you answer it, it will mean that you confirm your attendance at 3 weekly meetings, meeting 2 to 3 hours from Monday to Friday, at the times indicated by Dr. Omar. You are also agreeing to carry out individual activities which will be assigned to you during the meetings.

Project 15 Title: *Systematic Literature Review of Circular Economy associated to energetic industry, electronic waste, and education*

Mentor: Omar Gonzalez
Desired outcome of project: Literature review, Shadowing experience
Duration of the project: More than 8 weeks [beyond the REYES time period]
Project Description: Conduct all stages of a SLR covering the intersection of the topics of circular economy, energetic industry, electronic waste, and education. Develop research

questions and conduct a search for articles on scientific databases.
forms.gle



REYES 2024: You have been selected to participate as a member of project #15

1 message

Daniel Martín Gallego Cheno <A00833304@tec.mx> Wed, Jun 26, 2024 at 5:02 AM

To: 100mharshitiwari@gmail.com <100mharshitiwari@gmail.com>, che22v.padhy@stuiocb.ictmumbai.edu.in <che22v.padhy@stuiocb.ictmumbai.edu.in>, u22me215@med.svnit.ac.in <u22me215@med.svnit.ac.in>, nguyli01@gettysburg.edu <nguyli01@gettysburg.edu>, rubeshvetri121@gmail.com <rubeshvetri121@gmail.com>, spinetti.mdu@gmail.com <spinetti.mdu@gmail.com>, hhpfeil@ualberta.ca <hhpfeil@ualberta.ca>, adelina.baerligea@tum.de <adelina.baerligea@tum.de>, wl.tsai.2022@gmail.com <wl.tsai.2022@gmail.com>, mafaldaxapelli@gmail.com <mafaldaxapelli@gmail.com>, kathanshah405@gmail.com <kathanshah405@gmail.com>, sahashransu.2016@gmail.com <sahashransu.2016@gmail.com>, singu280805@gmail.com <singu280805@gmail.com>, gabrielaitzel.duartemaya@gmail.com <gabrielaitzel.duartemaya@gmail.com>, sophiathegem@gmail.com <sophiathegem@gmail.com>, bhavana.gudnavar_ug25@ashoka.edu.in <bhavana.gudnavar_ug25@ashoka.edu.in>, 220.pranavjohar@gmail.com <220.pranavjohar@gmail.com>, sara.soto@upr.edu <sara.soto@upr.edu>, karina.clemente.r@uni.pe <karina.clemente.r@uni.pe>, biswajoype.stud@nita.ac.in <biswajoype.stud@nita.ac.in>, mantavy.t@gmail.com <mantavy.t@gmail.com>, aditya_ratnaparkhi@yahoo.com <aditya_ratnaparkhi@yahoo.com>, meyyappankict@gmail.com <meyyappankict@gmail.com>, ncjinendra@gmail.com <ncjinendra@gmail.com>, shreya28001@gmail.com <shreya28001@gmail.com>, mohamedalazab112@gmail.com <mohamedalazab112@gmail.com>, nancy.23boe10120@vitbhopal.ac.in <nancy.23boe10120@vitbhopal.ac.in>, joelluevano95@gmail.com <joelluevano95@gmail.com>, verma.satyam.venky@gmail.com <verma.satyam.venky@gmail.com>, sambhav.antrikshaa@gmail.com <sambhav.antrikshaa@gmail.com>, work0priyanshu@gmail.com <work0priyanshu@gmail.com>, amityadav97268@gmail.com <amityadav97268@gmail.com>, harshasah5@gmail.com <harshasah5@gmail.com>, antony.echem@gmail.com <antony.echem@gmail.com>

Cc: Omar Israel González Peña <ogonzalez.pena@gmail.com>

Dear students,

You have been selected to participate as member of the project #15 "*Systematic Literature Review of Circular Economy associated to energetic industry, electronic waste, and education*".

Your mentor is Dr. Omar Gonzalez from Tecnologico de Monterrey.

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Project Description: Conduct all stages of a SLR covering the intersection of the topics of circular economy, energetic industry, electronic waste, and education. Develop research questions and conduct a search for articles on scientific databases. Capture relevant information from articles via the research questions, analyze insights, and collaborate on writing the review article.

First of all, it is mandatory to fill out this form so that the selected students who are **really interested** **CONFIRM THEIR COMMITMENT** to this project: <https://forms.gle/GnNwCeFGbxtfdiaY8>

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Best,
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Project 15 Title: *Systematic Literature Review of Circular Economy associated to energetic industry, electronic waste, and education*

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Duration of the project: More than 8 weeks [beyond the REYES time period]

Project Description: Conduct all stages of a SLR covering the intersection of the topics of circular economy, energetic industry, electronic waste, and education. Develop research questions and conduct a search for articles on scientific databases. Capture relevant information from articles via the research questions, analyze insights, and collaborate on writing the review article.

You have been selected to participate as a member of project #15 with Dr. Omar Gonzalez. If you received this Google Form and you answer it, it will mean that you confirm your attendance at 3 weekly meetings, meeting 2 to 3 hours from Monday to Friday, at the times indicated by Dr. Omar. You are also agreeing to carry out individual activities which will be assigned to you during the meetings.

Project 15 Title: *Systematic Literature Review of Circular Economy associated to energetic industry, electronic waste, and education*

Mentor: Omar Gonzalez
Desired outcome of project: Literature review, Shadowing experience
Duration of the project: More than 8 weeks [beyond the REYES time period]
Project Description: Conduct all stages of a SLR covering the intersection of the topics of circular economy, energetic industry, electronic waste, and education. Develop research

questions and conduct a search for articles on scientific databases.
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Summer Research Internship offer in PIED at BIT Sindri, Dhanbad

1 message

Mukesh Chandra <mukesh.prod@bitsindri.ac.in>
To: Satyam Verma <verma.satyam.venky@gmail.com>

Mon, Jun 17, 2024 at 7:39 PM

Dear Satyam Verma

I am pleased to inform you that you have been selected for the “**Summer Research Internship-2024**” at the **Department of Production and Industrial Engineering, BIT Sindri, Dhanbad**. The title of your internship will be "**Physics-informed Machine Learning for Manufacturing**." The mode of the internship is online.

The duration of the internship will be 6 weeks, starting from 18th June 2024 to 27th July 2024. This internship aims to provide hands-on training in research tools, techniques, methodologies, and equipment and to learn various other aspects of pursuing quality research.

As an intern, we expect you to perform all the assigned tasks to the best of your ability and follow any lawful and reasonable instructions provided to you.

Please reply to this email to confirm your acceptance by today.

Please note that the submission of the internship report and final recommendation of completion from the supervisor will be required to issue the internship certificate by the authority.

Once again, congratulations on securing the internship position. We are confident that you will make significant contributions to our team, and we are excited to have you join us.

Best of Luck!

With Best Regard!

--
Mukesh Chandra
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Summer Research Internship offer in PIED at BIT Sindri, Dhanbad

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Certificate of Participation

Certified that.....*Satyam Verma*.....

of.....*Sri Venkateswara College, New Delhi*.....

has actively participated in this Workshop held at S. N. Bose National Centre for Basic Sciences, Salt Lake, Kolkata 700 106, from July 22, 2024, to July 31, 2024.

Dated Kolkata, the 31st day of July, 2024.

Sunandan Gangopadhyay

Prof. SUNANDAN GANGOPADHYAY

S. N. Bose National Centre for Basic Sciences
Joint Convener, CKMMSWP 2024

Samit Kumar Ray

Prof. SAMIT KUMAR RAY

President
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Professor **Monika Tomar**

Coordinator
DSKC, Miranda House

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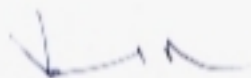
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*Research and Innovation Symposium in Computing
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PARTICIPATION CERTIFICATE

Satyam Verma

Has successfully attended Day 1 and Day 2 of CSE IIT Bombay's Research and Innovation Symposium in Computing at the IIT Bombay campus on 9th and 10th March, 2024.



Prof. Varsha Apte

Head of the Department
Computer Science and Engineering, IIT Bombay



Spectro-Timing Study of a Narrow Line Seyfert 1 galaxy IRAS 13224-3809

A Dissertation

BSc Physics Honours

Submitted By

Satyam Verma
(Roll no. 21009567024)



Under the guidance of
Dr. Main Pal

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MAY, 2024


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Acknowledgements

I extend my deepest appreciation to Dr. Main Pal for his exceptional mentorship, scholarly guidance, and continuous support throughout the research process of this dissertation.

Co-propagation of two laser beams in a plasma and Non linear channel formation by cross focusing considering relativistic Non linearity

A Bachelor's Dissertation Thesis

by

Kirti Tripathi

under the supervision of

Dr. Narender Kumar

Submitted to the University of Delhi for the degree of
BACHELORS OF SCIENCE [HONOURS COURSE] PHYSICS



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Special Thanks to My Mentor

Dear Dr. Narender Kumar,

I would like to extend my deepest gratitude for your invaluable guidance and support throughout my research project. Your expertise and dedication have been pivotal in the successful completion of my dissertation on "*Co-propagation of two laser beams in a plasma and Nonlinear channel formation by cross focusing considering relativistic Nonlinearity.*"

Your mentorship has not only enriched my understanding of the subject but has also inspired me to pursue excellence in my academic endeavors. I am truly grateful for the time and effort you invested in me.

Thank you once again for being an exceptional mentor and for playing such a significant role in my academic journey at the University of Delhi.

Warm regards,

Kirti Tripathi


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Certificate

This is to certify that the dissertation project titled “**Co-propagation of two laser beams in a plasma and Non Linear channel formation by cross focusing considering relativistic Non linearity without ponderomotive Non linearity**” submitted to the **University of Delhi** for the degree of **Bachelors of Science (Honours Course) Physics**, is the record of bona fide research work done by Kirti Tripathi under my supervision and guidance.



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(Supervisor)

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I would like to express my heartfelt gratitude to my supervisor, Dr. Narender Kumar, who gave me this opportunity to work on this project, "Co-propagation of two laser beams in a plasma and Non linear channel formation by cross focusing considering relativistic Non linearity". I would also like to express my heartiest gratitude to Dr. V.K. Tripathi who guided me throughout this project and resolved all the issues that came on my way during this period. I would also like to express my gratefulness to our department TIC Dr. Pratima Vyas who has been there as a constant support as and when required. I would also like to thank all the department staff and my institution, Sri Venkateswara College, University of Delhi, which allowed me to do this project and gain knowledge along with the progress.

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I have learned an unspeakable amount of lessons along this project and not to forget the academic knowledge I have gained is abundant. I have acquired greater insights into my research interests and hope to only go forward from here.

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Abstract

The study of highly intense laser plasmas gives rise to various wide-ranging potential applications and as a result, has been of extensive amount of interest. Some of the applications include laser-driven fusion, laser-based plasma accelerators, X-ray lasers, higher harmonic generations, etc. For all these processes the laser beam propagation needs to occur over several Rayleigh lengths while preserving interaction with plasmas. When a Laser is focused into some material (Plasma in my case), it has a tendency to diverge due to diffraction. For high power applications, we require a laser beam of very small dimension (of the order of few wavelengths). As laser has a natural tendency to diverge, we can't propagate it over a long length which is required for the applications mentioned above. So, we need ways to guide them.

Earlier studies have largely been confined to single beam Self-focusing, I have investigated the phenomena of cross-focusing, i.e. two beam focusing of a Gaussian laser beam in plasma under Relativistic non linearity. The ionization of air into plasma using the process of tunnel ionization has been slightly explored. The interaction of two Gaussian laser beams with plasma has been explored and analysed. A high and low power laser beams are taken simultaneously. The second-order ordinary differential equations for beam width of both the lasers are derived by adopting WKB and paraxial approximations. The graphs between propagation distance and beam width for various transverse components have been plotted. Using the established laser and plasma parameter values, conditions for optimized cross-focusing have been noted. The high power laser beam creates a channel which propagates the low power beam to a longer distance. The outcomes can be used in various applications mentioned above also my theory can be extended to consider multiple beam focusing.

Chapter 1

Theory

In this chapter, we introduce plasma as a fourth state of matter, ionization and production of plasma, tunnel ionization, laser-plasma interaction with different types of non-linearities, and finally self-focusing & defocusing of laser beam in plasma.

1.1 Ionization and Plasma

When gas is made to heat or energy is added to it, ionization of the atoms take place, forming what is called plasma. The term “fourth state of matter” for plasma was first given by W. Crookes in 1879 that described the ionized medium created in a gas discharge. The term “plasma” was first introduced in 1929 by Tonks and Langmuir. Plasma can be defined as a collection of charged and neutral particles which shows **collective behaviour** and admits **quasi-neutrality**. The term quasi-neutrality means that plasma should be neutral overall macroscopically. In small distances, the number of ions and electrons may differ causing small local electric fields. Collective behaviour means that each plasma particle interacts with a large number of other particles via long range electromagnetic forces and shows a simultaneous response of many particles to an external stimulus. Mutual shielding of plasma particles is an example of collective behaviour. It requires plasma dimensions to be greater than the Debye shielding length λ_d of the ions. It should exist for a period of time larger than the response time i.e., $T > \omega_p^{-1}$ where ω_p is the plasma frequency. Finally, number of particles within the Debye sphere in such a collection should be large enough so that it can be treated statistically. Plasma can be created by different kinds ionization of gases like tunnel ionization, and photoionization.

1.2 Types of ionization

When a laser pulse travels through a gas, it can cause the gas to become ionized. Ionization can happen through two main processes: electron collisions or the direct influence of intense laser fields, known as photo-ionization. When the laser intensity is moderate i.e. $< 10^{14} \text{W/cm}^2$ (with an electric field strength lower than the atomic Coulomb field),

atom ionization is primarily triggered by collisional or avalanche processes. This occurs within a few picoseconds. However, at higher intensity levels i.e. $> 10^{14} \text{ W/cm}^2$ (where the electric field strength is comparable to the Coulomb field), atoms are ionized through photo-ionization. This process leads to the formation of plasma on a subpicosecond time scale.

In addition to the laser's intensity, there are two additional factors called pulse frequency and duration that play a role in determining the ionization processes. When the laser has high intensity and a short pulse duration compared to the collision time, photoionization becomes the dominant process. Photoionization can occur through either tunneling or multiphoton processes.

To determine which one of the two photoionization processes takes place, some 40 years ago Keldysh (1965) and Perelomov et al. (1966) introduced a parameter now called Keldysh parameter γ given as [6]:

$$\gamma = \omega_L \sqrt{\frac{2E_{ion}}{I_L}} \quad (1.1)$$

- (i) For $\gamma < 1$, tunneling takes place
- (ii) For $\gamma > 1$, multiphoton ionization takes place.

1.2.1 Tunnel Ionization

The ionization that we will be studying to create plasma channel in air is tunnel ionization. It is a fundamental process in intense laser-atom interaction. When the electric field strength of the laser pulse and the binding coulomb field inside the atom become comparable, a potential barrier is formed through which an electron of the atom can tunnel out. It is a quantum mechanical phenomenon as it gives a non-zero probability for observing particle after tunnelling through the deformed Coulomb potential barrier. If the intensity of the laser is further increased, the laser field tend to suppress the potential barrier to an extent that electron is able to escape from the atom freely, as illustrated in Fig. 1.1(a). This is called over the barrier ionization (OTBI) or barrier suppression ionization (BSI) [13]. The tunnelled electron is then driven by the laser field and can return back to the parent ion and can initiate many interesting phenomena like higher-order harmonic generation, enhanced multiple ionization, etc.

1.2.2 Multiphoton Ionization

In the context of multi-photon ionization, numerous photons are absorbed simultaneously. The energy equilibrium of this process, taking into account N photons with absorbed energy, can be expressed as follows:

$$E_I + E_k + E_{int} = Nh\nu$$

where N is the minimum number of photons required for the MPI process, E_k is the kinetic energy of the ejected electron and E_{int} is the internal rotational and vibrational energy of the system directly after the ionization process. Above threshold ionization

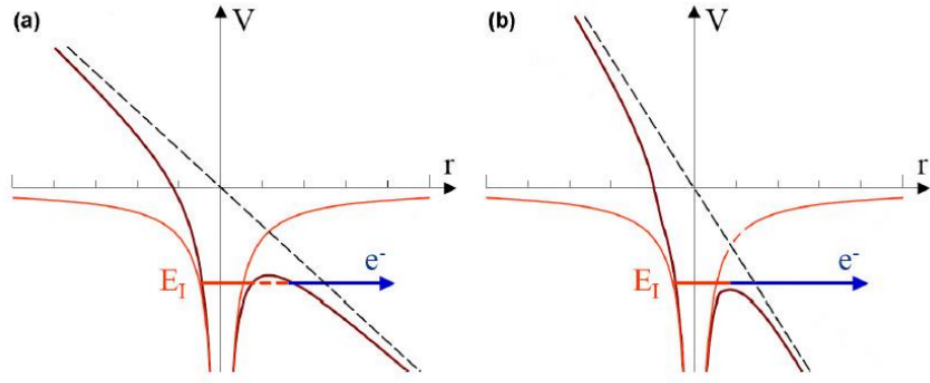


Figure 1.1: (a) Tunneling Ionization (b) Barrier suppression ionization (BSI) [13]

refers to a phenomenon where, at higher intensities, an electron has the ability to absorb a greater number of photons than the minimum required for ionization. In this case, the electron absorbs $N + M$ photons, surpassing the minimum threshold.

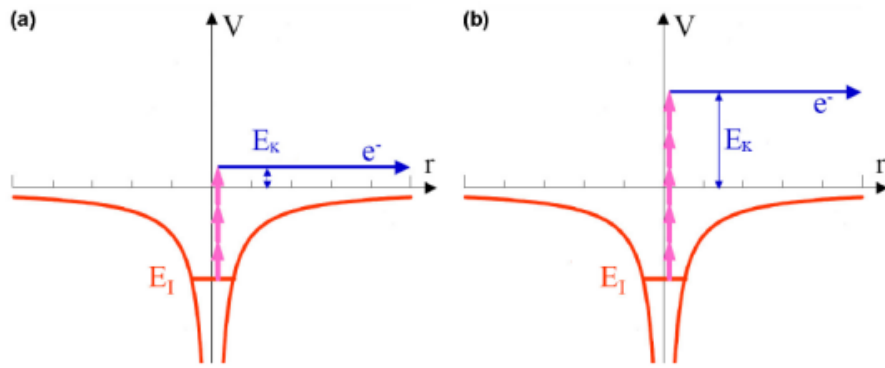


Figure 1.2: (a) Multiphoton Ionization (b) Above threshold ionization (ATI) [13]

1.3 Self Focusing and defocusing of Laser Beam

The propagation of laser through plasma results in generation of several instabilities like filamentation, self-focusing, generation of harmonics, and scattering instabilities, etc. The coupling efficiency of laser plasma is hugely affected on account of these nonlinear phenomena.

Self-focusing and self-trapping are two examples of these nonlinear optical effects which may arise from one of many physical mechanisms. **Self-focusing** is a non-linear optical phenomenon that is produced by the change in refractive index of the medium as a result of laser beam passing through it. If the refractive index of medium increases with the

increase electric field intensity, it will act as focusing lense.

Self-focusing of light was discovered by Gurgen Askaryan. The phenomenon was predicted by Askaryan [8] theoretically including thermal and ponderomotive force nonlinearities. Akhmanov et al. [1] developed a paraxial theory to study the laser beam propagation in a medium having cubic nonlinearity. After that, the paraxial theory for self-focusing has been used widely in literature. In 1964, Hercher [9] was the first who observed self-focusing experimentally. [13]

When an intense laser beam is incident on a nonlinear medium, the refractive index of the medium becomes intensity (**I**) dependent given by

$$\eta = \eta_0 + \eta_2 \quad (1.2)$$

where η_0 and η_2 are the linear and nonlinear respectively. Due to diffraction, the laser beam becomes defocused. For self-focusing to take place power of the beam should be greater than the critical power required to overcome diffraction i.e.,

$$P > P_{cr} = \frac{\lambda^2}{2\pi\eta_0\eta_2} \quad (1.3)$$

In case of plasma, the refractive index including the nonlinear effects is given by Esarey et al. [5] as

$$\eta(r) = 1 - \frac{\omega_p^2 n(r)}{2\omega^2 \eta_0 \gamma(r)} \quad (1.4)$$

where ω_p the plasma frequency, ω is the laser frequency of the incident laser beam, n_0 is the plasma density, n is the local electron plasma density and γ is the relativistic factor. [3]

- (i) when $P = P_{cr}$, the beam will propagate without any convergence and divergence creating a self channel;
- (ii) when $P < P_{cr}$, the beam will diverge;
- (iii) when $P > P_{cr}$, the beam will self focus and convergence will occur.

1.3.1 Ponderomotive Self Focusing

It is the kind of self-focusing that occurs in the presence of ponderomotive force. Ponderomotive force is a non-linear force experienced by charged particles in plasma as a result of laser intensity gradient fig(1.3). It is given by,

$$\vec{F}_p = -\frac{e^2}{4m\omega^2} \nabla E^2 \quad (1.5)$$

where m is the mass of the electron, e is the charge on an electron, E is the electric field of the laser beam, and ω is the angular frequency of the laser beam. For example, let us take a laser beam such that its intensity is maximum at the center and decreases rapidly radially outwards. The direction of the gradient of laser intensity is from lower field to higher field region. Ponderomotive force will act in the direction opposite of the laser

intensity gradient (because of the negative sign) and will push the electrons from higher field region to the lower field region. The force on ions will be negligible due to their heavy mass. [16, 12, 10]

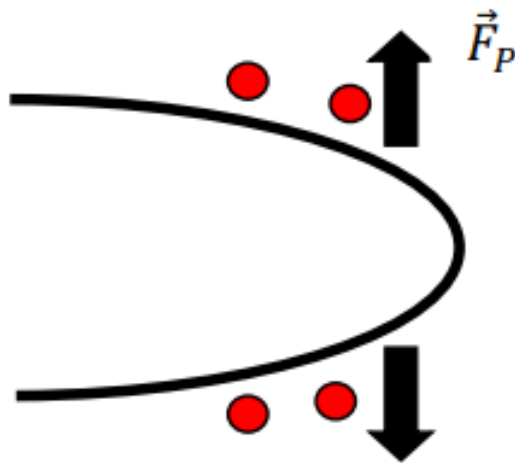


Figure 1.3: Ponderomotive Force effect on electrons
[13]

When such a beam passes through a plasma, the phase velocity of the wave is going to be minimum on the axis, because of increased refractive index and increases constantly away from it. As the wave fronts propagate through such a duct, it gains a curvature and begins to focus fig(1.4). Focusing leads to an increase in intensity which causes further deeper density depression and it goes on. After a point the duct becomes completely depleted of plasma and diffraction divergence supersedes the nonlinear self-focusing. The beam will acquire a minimum radius at some point beyond which it diverges. As beam width increases, the axial intensity starts to decrease and the saturation effect of non-linearity becomes less important, non-linear refraction becomes stronger and self-focusing starts. Hence, we can see periodic focusing and defocusing. We can choose a radiation intensity profile for which self-focusing and diffraction effects are evenly balanced and the beam propagates as a spatial soliton. [4]

This non-linearity is important in long pulse experiments where power densities are usually low and we will be focusing more on this non-linearity as we are using it in our experiment. But let us briefly go through other types of non-linearities as well.

1.3.2 Relativistic Self Focusing

At very high power densities of more than 10^{18}W/cm^2 , electron oscillatory velocity tends towards velocity of light. Hence, the relativistic mass of electron increases with laser beam intensity, causing local increase in the refractive index. It is an instantaneous phenomenon and is important at short pulse experiments. [7, 2, 16]

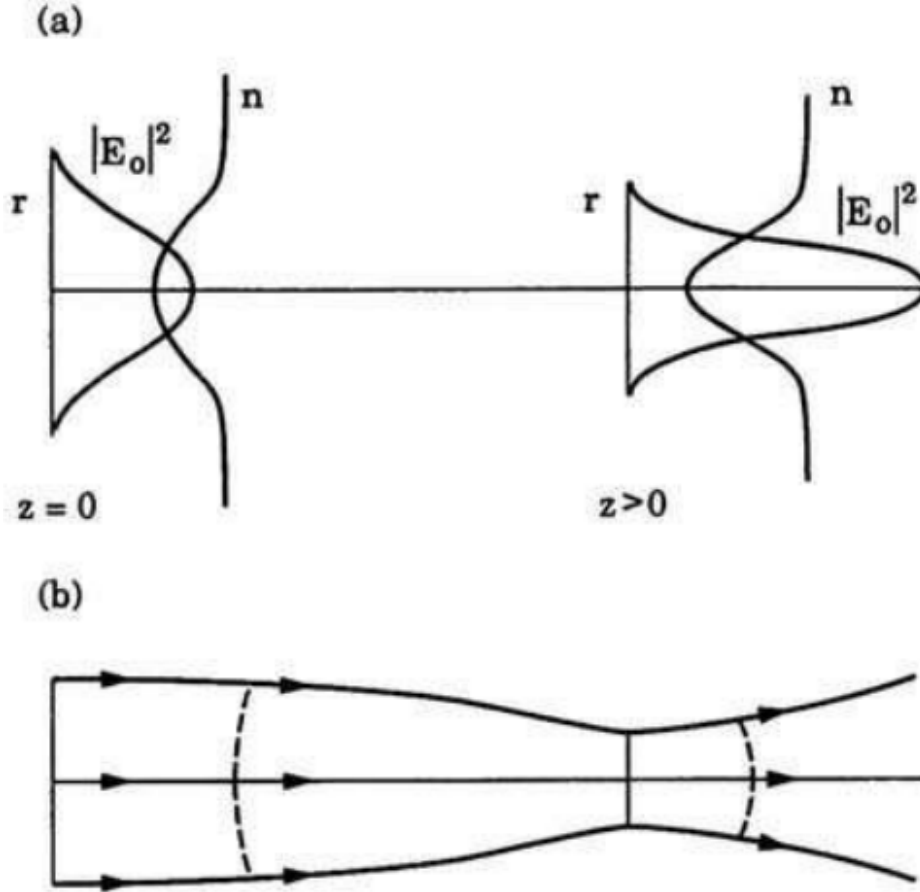


Figure 1.4: (a) Intensity profile and density depression. (b) Wavefront at different values of z [4]

The propagation of an intense laser beam in a plasma can result in self focusing by creating a density depression in the plasma, as well as by increasing the electron mass by relativistic effects. The density depression is due to a transverse ponderomotive force, which tends to expel the plasma from the high field regions. The radial ponderomotive force on electrons is larger than that on the ions by a factor equal to the mass ratio. The electrons forced out of the laser beam region set up an electrostatic restoring force, which causes the ions to be expelled on a slower time scale. The charge separation that causes the electrostatic restoring force extends over a Debye length, which is assumed to be small compared with the laser-beam radius. This density depression creates a local increase in the effective index of refraction and acts as an optical guide for the laser beam. In addition to this self-focusing mechanism, a further reduction in the plasma frequency occurs in the region of high field intensity due to relativistic mass increase of the electrons in the presence of the laser beam. The self-focusing due to the density depression occurs on a longer time scale than the self-focusing due to the relativistic mass increase.

1.3.3 Ohmic Self Focusing

When the time duration of the electromagnetic beam is longer than temperature relaxation time of plasma, Ohmic heating of electrons comes into play. It can modify refractive index of plasma by changing the electron density. But in this case the electrons migrate from the high intensity regions to low intensity regions due to the temperature gradient produced by incident laser beam. [16, 11]

1.4 Cross-Focusing of two Co-axial Gaussian laser beams

Self-focusing can focus a beam itself whereas Cross-focusing means a high intensity laser beam has created a channel that also guides a low intensity laser beam.

When the beam intensity is very high, electron velocity becomes comparable to the velocity of light and the mass of electron becomes relativistic. So, mass increases with velocity. When there are two laser beams then both the lasers impart oscillatory velocities to electrons and they consequently contribute to enhancement of mass. The enhancement in mass decreases the effective plasma frequency and the refractive index goes up which causes the convergence of the beam creating a channel that guides the other lower power beam too.

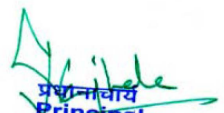
1.4.1 Gaussian Laser beam

The intensity distribution of Gaussian laser beam can be written as [14]:

$$A_0^2 = \frac{E_0^2}{f^2} e^{-\frac{r^2}{r_0^2 f^2}} \quad (1.6)$$

where $f(z)$ denotes dimensionless beam width parameter, r_0 is the radius of laser beam at $z=0$, $r_0 f$ gives instantaneous radius of laser beam.

From fig(1.5), we can see how the beam is truncated around the center and the intensity goes to zero as we go axially outwards.


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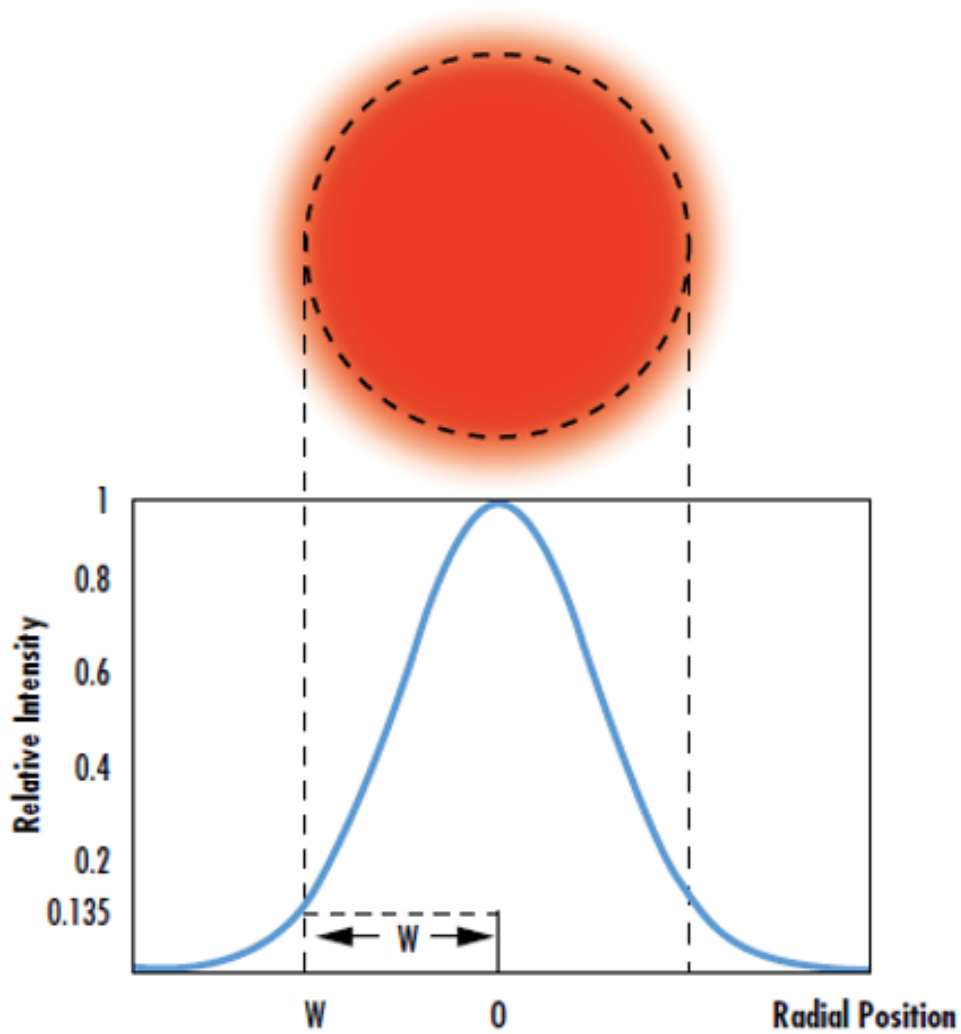


Figure 1.5: The waist of a Gaussian beam is defined as the location where the irradiance is $1/e^2$ of its maximum value

[LaserOptics2024]

Chapter 2

Theoretical and Numerical Analysis

2.1 Formation of Plasma Channel in air

Let us take the gas made up of nitrogen atoms (as air is made up of 78% of nitrogen). First ionization energy of nitrogen atom is $\approx 14.6\text{eV}$. Keldysh parameter is obtained as: $\omega_L \approx 10^{15}\text{rad/s}$, $I_L = 10^{15}\text{W/cm}^2$

$$\gamma \approx 7 \times 10^{-4} \ll 1$$

Therefore, tunnel ionization will take place in this case and it will ionize the air in time less than the pulse scale.

Following Keldysh, the rate of tunnel ionization of an atom in some given state of ionization is given as: [6]

$$\tau = \frac{4me^4}{\hbar} \left(\frac{E_i}{E_h}\right)^{5/2} \frac{E_a}{E_L(t)} \exp\left[-\frac{2}{3} \left(\frac{E_i}{E_h}\right)^{3/2} \frac{E_a}{E_L(t)}\right] \quad (2.1)$$

where E_i and E_h , are the ionization potentials of the atom and hydrogen respectively, $E_a = 5.1 \times 10^9\text{V/m}$ and E_L is the instantaneous laser field. When a laser pulse, characterized by its intensity of 10^{14}W/cm^2 , traverses through the air, it rapidly causes ionization of the constituent molecules. This ionization process leads to the formation of a cylindrical plasma channel. The density of the plasma exhibits a broad peak near the center of the laser axis but decreases rapidly towards the periphery. When the intensity of the pulse is below 10^{14}W/cm^2 , the nitrogen atoms do not completely lose their orbiting electrons.

However, following the passage of the pulse, as the electrons collide with the partially ionized atoms, they are efficiently stripped of all their electrons within a timeframe ranging from picoseconds to subnanoseconds.

2.2 Effective Dielectric Constant

When a Gaussian laser beam travels through plasma, the evacuation of electrons occurs from the higher-intensity region as a result of ponderomotive force. This modifies electron density of plasma as[14] :

$$\begin{aligned} n_e &= n_0 + \delta n \\ m &= m_0 + \delta m \end{aligned} \quad (2.2)$$

This modified electron density will affect the dielectric function of plasma as[14]

$$\epsilon_r = \epsilon_0 - \frac{n_0 e^2}{m_0 \epsilon_0} - \left(\frac{\delta n}{n_0} - \frac{\delta m}{m_0} \right) \frac{e^2 n_0}{m_0 \epsilon_0} \quad (2.3)$$

where ω_p is the plasma frequency in the absence of laser beam. It can be seen that the dielectric constant becomes a function of intensity of the laser beam.

Separating dielectric function into linear and nonlinear terms for first laser beam, we get

$$\epsilon_r(\omega_1) = \epsilon_{r0} + \phi_1(A_1 A_1^*) \quad (2.4)$$

Separating dielectric function into linear and nonlinear terms for second laser beam, we get[14]

$$\epsilon_r(\omega_2) = \epsilon_{r1} + \phi_2(A_2 A_2^*) \quad (2.5)$$

where $\epsilon_{r0} = 1 - \frac{\omega_p^2}{\gamma \omega_1^2}$,

$\epsilon_{r1} = 1 - \frac{\omega_p^2}{\gamma \omega_2^2}$,

$\phi_1(A_1 A_1^*) = \frac{\omega_p^2}{\omega_1^2} \left(1 - \frac{1}{\gamma}\right)$,

$\phi_2(A_2 A_2^*) = \frac{\omega_p^2}{\omega_2^2} \left(1 - \frac{1}{\gamma}\right)$,

also $\gamma = \left(1 + \frac{(eA_1/c)^2}{2} + \frac{(eA_2/c)^2}{2}\right)^{\frac{1}{2}}$

2.3 Theoretical Considerations

Many works have been done until now to find the analytical approach to investigate cross-focusing in nonlinear media. Here, we are going to consider the approach based on parabolic wave equation. Using two Maxwell's equations viz. Faraday's law and Ampere's Law for the case of non-conducting, non-absorbing, and an isotropic medium

$$(J = 0, \rho = 0, \mu = 1)$$

$$\vec{\nabla} \times \vec{H} = \frac{\partial D}{\partial t} = i\omega\mu_0 \vec{H} \quad (2.6)$$

$$\vec{\nabla} \times \vec{E} = -\frac{\partial B}{\partial t} = -i\omega\epsilon_0 \epsilon_L \vec{E} \quad (2.7)$$

where $\vec{E}$ & $\vec{H}$ represent electric and magnetic field for the incident laser beam. $\vec{D}$ represents displacement vector.

We also know, [14]

$$\epsilon_r = \epsilon_L + \frac{i\sigma}{\omega\epsilon_0} \quad (2.8)$$

Taking curl of (2.7), we get,

$$\vec{\nabla} \times (\vec{\nabla} \times \vec{E}) = -i\omega\mu_0(\vec{\nabla} \times \vec{H}) \quad (2.9)$$

$$\vec{\nabla} \times (\vec{\nabla} \times \vec{E}) = i\omega\mu_0(-i\omega\epsilon_0\epsilon_r\vec{E}) \quad (2.10)$$

$$\vec{\nabla} \times (\vec{\nabla} \times \vec{E}) = \frac{\omega^2}{c^2}\epsilon_r\vec{E} \quad (2.11)$$

By vector property, we know that,

$$\vec{\nabla} \times (\vec{\nabla} \times \vec{E}) = -\nabla^2\vec{E} + \vec{\nabla}(\vec{\nabla} \cdot \vec{E}) \quad (2.12)$$

So,

$$-\nabla^2\vec{E} + \vec{\nabla}(\vec{\nabla} \cdot \vec{E}) = \frac{\omega^2}{c^2}\epsilon_r\vec{E} \quad (2.13)$$

We have ignored the term $\nabla(\nabla \cdot \vec{E})$ on account of $\frac{1}{k^2}|\nabla^2(\ln\epsilon)| \ll 1$. Ignoring it, we get,

$$\nabla^2 E + \frac{\omega^2}{c^2}\epsilon E = 0 \quad (2.14)$$

The solutions of Eq(2.14) can be written in the form of planar wave as

$$E(r, z) = A(r, z)\exp[i(\omega t - kz)] \quad (2.15)$$

where

$$k^2 = \frac{\epsilon\omega^2}{c^2}$$

And similarly for two laser beams of frequency ω_1 and ω_2 ,

$$E_j(r, z) = A_j(r, z)e^{i(\omega_j t - k_j z)} \quad (2.16)$$

where $k_j^2 = \frac{\epsilon_{rj}\omega_j^2}{c^2}$,
and $j = 1, 2$

Now, substituting for E from Eq(2.14) in Eq(2.16), we get

$$\nabla^2 E = \frac{\epsilon_{rj}}{c^2} \frac{\partial^2 E}{\partial t^2} \quad (2.17)$$

2.3.1 The Parabolic Equation

For a nonlinear medium, permittivity takes the nonlinear form as

$$\epsilon(\omega_j) = \epsilon_{rj} + \phi_j(E_j E_j^*) \quad (2.18)$$

In this case, general solution of Eq(2.17) cannot be obtained. However, we can find a solution considering common experimental situations like slowly converging/ diverging cylindrically symmetric beams. Their wavefront will not be very different from a plane wavefront when $\phi \ll \epsilon_{00}$. Hence, we consider a solution of the form

$$E_j(r, z) = A_j(r, z)e^{i(\omega_j t - k_j z)} \quad (2.19)$$

where $k_j^2 = \frac{\epsilon_{rj}\omega_j^2}{c^2}$, and $j = 1, 2$

Substituting Eq(2.17) and Eq(2.18) in Eq(2.19), we get

$$2ik_j \frac{\partial A_j}{\partial z} = \frac{\partial^2 A_j}{\partial z^2} + \frac{\partial^2 A_j}{\partial r^2} + \frac{1}{r} \frac{\partial A_j}{\partial r} + \frac{k_j^2}{\epsilon_{rj}} \phi_j \left(\frac{1}{2} A_j A_j^* \right) A_j \quad (2.20)$$

Making the use of WKB approximations assuming that change in $A(r, z)$ in z direction is slow in comparison to radial direction Eq(2.20) reduces to

$$2ik_j \frac{\partial A_j}{\partial z} = \frac{\partial^2 A_j}{\partial r^2} + \frac{1}{r} \frac{\partial A_j}{\partial r} + \frac{k_j^2}{\epsilon_{rj}} \phi_j \left(\frac{1}{2} A_j A_j^* \right) A_j \quad (2.21)$$

Introducing Eikonal $S(r, z)$, we can assume the variation $A_j(r, z)$ given as

$$A_j(r, z) = A_{0j}(r, z)e^{-ik_j S_j(r, z)} \quad (2.22)$$

Putting value of $A_j(r, z)$ in Eq(2.21), and equating real and imaginary parts as

$$2 \frac{\partial S_j}{\partial z} + \left(\frac{\partial S_j}{\partial r} \right)^2 = \frac{\phi_j}{\epsilon_{rj}} + \frac{1}{k_j^2 A_{0j}} \left(\frac{\partial^2 A_{0j}}{\partial r^2} + \frac{1}{r} \frac{\partial A_{0j}}{\partial r} \right) \quad (2.23)$$

$$\frac{\partial A_{0j}^2}{\partial z} + \frac{\partial A_{0j}}{\partial r} \frac{\partial S_j}{\partial r} + A_{0j}^2 \left(\frac{\partial^2 S_j}{\partial r^2} + \frac{1}{r} \frac{\partial S_j}{\partial r} \right) = 0 \quad (2.24)$$

In Eq(2.23) and Eq(2.24), the first term in RHS represents nonlinear refraction term that is responsible for self focusing and the second term represents diffraction term responsible for defocusing. The equation itself determines the convergence or divergence of the beam.

2.3.2 Finding solution for slowly converging/diverging beams

A rigorous solution of Eq(2.23) & (2.24) is not possible. So, we look for approximate solution assuming that non-linear and diffraction term in Eq(2.23) are absent. We get,

$$2\frac{\partial S_j}{\partial z} + \left(\frac{\partial S_j}{\partial r}\right)^2 = 0 \quad (2.25)$$

Substituting S_j to be separable solution,

$$S_j = R_j(r)Z_j(z) \quad (2.26)$$

and solving for S_j . We get

$$S(r, z) = \frac{r^2}{2(z_j + R_j)} \quad (2.27)$$

Eq(2.27) represents approximately a spherical wave where R is radius of curvature of the wavefront at $z=0$.

The phase factor of spherical wave is of the form $e^{ik\rho}$ where ρ is the distance measured from center of the spherical wavefront. So, from Eq(2.19) and Eq(2.22),

$$S_j + z_j = \rho = \sqrt{r^2 + (R_j + z_j)^2} \quad (2.28)$$

where center of wavefront lies at $z = -R$.

Assuming $r \ll R_j + z_j$, we obtain,

$$S_j \approx R_j + \frac{r^2}{2(R_j + z_j)} \quad (2.29)$$

Not neglecting $\frac{\partial^2 A_0}{\partial z^2}$ in Eq(2.21), we would obtain,

$$S_j = (r^2 + (R_j + z_j)^2)^{1/2} - z_j \quad (2.30)$$

For slowly converging/ diverging beams, assuming mathematically convenient solution,

$$S_j = \frac{r^2}{2}\beta_j(z) + \psi_j(z) \quad (2.31)$$

Using Eq(2.31) in Eq (2.24), we obtain the general solution of A_0^2 to be of the form

$$A_{0j}^2 = \frac{E_{0j}^2}{f_j^2} \Gamma\left(\frac{r}{r_{0j}f_j(z)}\right) \quad (2.32)$$

where Γ is an arbitrary function of its argument.

2.4 Beam Width evolution

Using Eq(2.32), the amplitude distribution of Gaussian beams can be written as,

$$A_j = \frac{A_{0j}}{f_j} e^{-\frac{r^2}{2r_{0j}^2 f_j^2}} \quad (2.33)$$

Following the treatment for the beam, let us find out the diffraction and nonlinear refraction term separately and then substitute them in Eq(2.23).

For Diffraction term:

$$\frac{\partial A_j}{\partial r} = \frac{A_{0j}}{f_j} e^{-\frac{r^2}{2r_{0j}^2 f_j^2}} \left(-\frac{r}{r_{0j}^2 f_j^2}\right) \quad (2.34)$$

$$\frac{\partial^2 A_j}{\partial r^2} = \frac{A_{0j}}{f_j} \frac{e^{-\frac{r^2}{2r_{0j}^2 f_j^2}}}{r_{0j}^2 f_j^2} \left[-1 + \frac{r^2}{r_{0j}^2 f_j^2}\right] \quad (2.35)$$

$$\frac{\partial^2 A_j}{\partial r^2} + \frac{1}{r} \frac{\partial A_j}{\partial r} = \frac{A_{0j}}{f_j} \frac{e^{-\frac{r^2}{2r_{0j}^2 f_j^2}}}{r_{0j}^2 f_j^2} \left[-1 + \frac{r^2}{r_{0j}^2 f_j^2}\right] + \frac{1}{r} \frac{A_{0j}}{f_j} e^{-\frac{r^2}{2r_{0j}^2 f_j^2}} \left(-\frac{r}{r_{0j}^2 f_j^2}\right) \quad (2.36)$$

Therefore,

$$\frac{1}{k^2 A_{0j}} \left(\frac{\partial^2 A_{0j}}{\partial r^2} + \frac{1}{r} \frac{\partial A_{0j}}{\partial r} \right) = \frac{r^2}{k_j^2 r_{0j}^4 f_j^4} - \frac{2}{k_j^2 r_{0j}^2 f_j^2} \quad (2.37)$$

This is the diffraction term. Now, let us find the nonlinear refraction term.

Applying Taylor series expansion on $\phi(A_{0j} A_{0j}^*)$ about $r = 0$ and expanding till second power of r , we obtain

$$\phi_j = \phi_j|_{r=0} + r \frac{\partial \phi_j}{\partial r}|_{r=0} + \frac{r^2}{2} \frac{\partial^2 \phi_j}{\partial r^2}|_{r=0}$$

As we have seen in section 2.2,

$$\phi_j = \frac{\omega_p^2}{\omega_j^2} \left(1 - \frac{1}{\gamma}\right)$$

$$\text{where } \gamma = \left(1 + \frac{e^2 A_1 A_1^*}{2m^2 c^2 \omega_1^2} + \frac{e^2 A_2 A_2^*}{2m^2 c^2 \omega_2^2}\right)^{1/2}$$

$$\phi_j|_{r=0} = \frac{\omega_p^2}{\omega_j^2} \left(1 - \frac{1}{\left(1 + \frac{e^2 A_{01} A_{01}^*}{2m^2 c^2 \omega_1^2} + \frac{e^2 A_{02} A_{02}^*}{2m^2 c^2 \omega_2^2}\right)^{1/2}}\right) \quad (2.38)$$

Now,

$$\gamma^2 = \left(1 + \frac{e^2 A_1 A_1^*}{2m^2 c^2 \omega_1^2} + \frac{e^2 A_2 A_2^*}{2m^2 c^2 \omega_2^2}\right) \quad (2.39)$$

$$\frac{\partial \gamma^2}{\partial r} = \frac{e^2 A_1 A_1^*}{2m^2 c^2 \omega_1^2} \left(\frac{-2r}{r_{01}^2 f_1^2}\right) + \frac{e^2 A_2 A_2^*}{2m^2 c^2 \omega_2^2} \left(\frac{-2r}{r_{02}^2 f_2^2}\right) \quad (2.40)$$

$$\frac{\partial^2 \gamma^2}{\partial r^2} = \frac{e^2 A_1 A_1^*}{2m^2 c^2 \omega_1^2} \left(\frac{-4r^2}{r_{01}^4 f_1^4}\right) + \left(\frac{-2}{r_{01}^2 f_1^2}\right) \frac{e^2 A_1 A_1^*}{2m^2 c^2 \omega_1^2} + \frac{e^2 A_2 A_2^*}{2m^2 c^2 \omega_2^2} \left(\frac{-4r^2}{r_{02}^4 f_2^4}\right) + \left(\frac{-2}{r_{02}^2 f_2^2}\right) \frac{e^2 A_2 A_2^*}{2m^2 c^2 \omega_2^2} \quad (2.41)$$

$$\gamma|_{r=0} = (1 + \frac{e^2 A_{01} A_{01}^*}{2m^2 c^2 \omega_1^2} + \frac{e^2 A_{02} A_{02}^*}{2m^2 c^2 \omega_2^2})^{1/2} \quad (2.42)$$

$$\frac{\partial \gamma^2}{\partial r}|_{r=0} = 0 \quad (2.43)$$

$$\frac{\partial^2 \gamma^2}{\partial r^2}|_{r=0} = (\frac{-2}{r_{01}^2 f_1^2}) \frac{e^2 A_1 A_1^*}{2m^2 c^2 \omega_1^2} + (\frac{-2}{r_{02}^2 f_2^2}) \frac{e^2 A_2 A_2^*}{2m^2 c^2 \omega_2^2} \quad (2.44)$$

$$\frac{\partial \phi_j}{\partial r} = \frac{\omega_p^2}{\omega_j^2} (\frac{1}{2\gamma^3}) (\frac{\partial \gamma^2}{\partial r})$$

As $|A_{0j}| = \text{maximum at } r=0$,

$$\frac{\partial \phi_j}{\partial r}|_{r=0} = 0 \quad (2.45)$$

$$\frac{\partial^2 \phi_j}{\partial r^2} = -\frac{\omega_p^2}{\omega_j^2} (\frac{3}{2\gamma^4}) (\frac{\partial \gamma^2}{\partial r})^2 (\frac{1}{2\gamma}) + \frac{\omega_p^2}{\omega_j^2} (\frac{1}{2\gamma^3}) (\frac{\partial^2 \gamma^2}{\partial r^2})$$

$$\frac{\partial^2 \phi_j}{\partial r^2}|_{r=0} = -(\frac{\omega_p^2}{\omega_j^2}) \frac{1}{2(1 + \frac{e^2 A_{01} A_{01}^*}{2m^2 c^2 \omega_1^2} + \frac{e^2 A_{02} A_{02}^*}{2m^2 c^2 \omega_2^2})^{3/2}} ((\frac{2}{r_{01}^2 f_1^2}) \frac{e^2 A_1 A_1^*}{2m^2 c^2 \omega_1^2} + (\frac{2}{r_{02}^2 f_2^2}) \frac{e^2 A_2 A_2^*}{2m^2 c^2 \omega_2^2}) \quad (2.46)$$

Finally, we have

$$\begin{aligned} \phi_j(A_{0j}^2) &= \frac{\omega_p^2}{\omega_j^2} (1 - \frac{1}{(1 + \frac{e^2 A_{01} A_{01}^*}{2m^2 c^2 \omega_1^2} + \frac{e^2 A_{02} A_{02}^*}{2m^2 c^2 \omega_2^2})^{1/2}}) \\ &\quad - (\frac{r^2}{2}) (\frac{\omega_p^2}{\omega_j^2}) \frac{1}{(1 + \frac{e^2 A_{01} A_{01}^*}{2m^2 c^2 \omega_1^2} + \frac{e^2 A_{02} A_{02}^*}{2m^2 c^2 \omega_2^2})^{3/2}} \\ &\quad ((\frac{2}{r_{01}^2 f_1^2}) \frac{e^2 A_1 A_1^*}{2m^2 c^2 \omega_1^2} + (\frac{2}{r_{02}^2 f_2^2}) \frac{e^2 A_2 A_2^*}{2m^2 c^2 \omega_2^2}) \end{aligned} \quad (2.47)$$

The nonlinear term will become,

$$\begin{aligned} \frac{\phi_j(A_{0j}^2)}{\epsilon_{rj}} &= \frac{\omega_p^2}{\omega_j^2 \epsilon_{rj}} \left(1 - \frac{1}{\left(1 + \frac{e^2 A_{01} A_{01}^*}{2m^2 c^2 \omega_1^2} + \frac{e^2 A_{02} A_{02}^*}{2m^2 c^2 \omega_2^2} \right)^{1/2}} \right) \\ &\quad - \left(\frac{r^2}{2} \right) \left(\frac{\omega_p^2}{\omega_j^2 \epsilon_{rj}} \right) \frac{1}{\left(1 + \frac{e^2 A_{01} A_{01}^*}{2m^2 c^2 \omega_1^2} + \frac{e^2 A_{02} A_{02}^*}{2m^2 c^2 \omega_2^2} \right)^{3/2}} \\ &\quad \left(\left(\frac{2}{r_{01}^2 f_1^2} \right) \frac{e^2 A_1 A_1^*}{2m^2 c^2 \omega_1^2} + \left(\frac{2}{r_{02}^2 f_2^2} \right) \frac{e^2 A_2 A_2^*}{2m^2 c^2 \omega_2^2} \right) \end{aligned} \quad (2.48)$$

Using Paraxial approximations:

$$S_j = \psi_j(z) + \frac{r^2}{2} \beta_j$$

$$2 \frac{\partial S_j}{\partial r} + \left(\frac{\partial S_j}{\partial r} \right)^2 = 2 \frac{\partial \psi_j}{\partial z} + \beta_j^2 r^2 + \frac{\partial \beta_j}{\partial r} r^2 \quad (2.49)$$

From Eq(2.23), (2.37), (2.48) and (2.49), we get

$$\begin{aligned} 2 \frac{\partial \psi_j}{\partial z} + \beta_j^2 r^2 + \frac{\partial \beta_j}{\partial r} r^2 &= \frac{\omega_p^2}{\omega_j^2 \epsilon_{rj}} \left(1 - \frac{1}{\left(1 + \frac{e^2 A_{01} A_{01}^*}{2m^2 c^2 \omega_1^2} + \frac{e^2 A_{02} A_{02}^*}{2m^2 c^2 \omega_2^2} \right)^{1/2}} \right) \\ &\quad - \left(\frac{r^2}{2} \right) \left(\frac{\omega_p^2}{\omega_j^2 \epsilon_{rj}} \right) \frac{1}{\left(1 + \frac{e^2 A_{01} A_{01}^*}{2m^2 c^2 \omega_1^2} + \frac{e^2 A_{02} A_{02}^*}{2m^2 c^2 \omega_2^2} \right)^{3/2}} \\ &\quad \left(\left(\frac{2}{r_{01}^2 f_1^2} \right) \frac{e^2 A_1 A_1^*}{2m^2 c^2 \omega_1^2} + \left(\frac{2}{r_{02}^2 f_2^2} \right) \frac{e^2 A_2 A_2^*}{2m^2 c^2 \omega_2^2} \right) + \frac{r^2}{k_j^2 r_{0j}^4 f_j^4} - \frac{2}{k_j^2 r_{0j}^2 f_j^2} \end{aligned} \quad (2.50)$$

Equating the coefficients of r^2 in Eq(2.50),

$$\begin{aligned} \beta_j^2 + \frac{\partial \beta_j}{\partial r} &= \frac{1}{k_j^2 r_{0j}^4 f_j^4} - \left(\frac{1}{2} \right) \left(\frac{\omega_p^2}{\omega_j^2 \epsilon_{rj}} \right) \frac{1}{\left(1 + \frac{e^2 A_{01} A_{01}^*}{2m^2 c^2 \omega_1^2} + \frac{e^2 A_{02} A_{02}^*}{2m^2 c^2 \omega_2^2} \right)^{3/2}} \\ &\quad \left(\left(\frac{2}{r_{01}^2 f_1^2} \right) \frac{e^2 A_1 A_1^*}{2m^2 c^2 \omega_1^2} + \left(\frac{2}{r_{02}^2 f_2^2} \right) \frac{e^2 A_2 A_2^*}{2m^2 c^2 \omega_2^2} \right) \end{aligned} \quad (2.51)$$

Let,

$$a_j = \frac{e A_{0j}}{m \omega_j c} \quad (2.52)$$

Then eq(2.51) is modified as,

$$\beta_j^2 + \frac{\partial \beta_j}{\partial r} = \frac{1}{k_j^2 r_{0j}^4 f_j^4} - \left(\frac{1}{2 r_{0j}^2} \right) \left(\frac{\omega_p^2}{\omega_j^2 \epsilon_{rj}} \right) \frac{1}{\left(1 + \frac{a_1^2}{2} + \frac{a_2^2}{2} \right)^{3/2}} \left(\left(\frac{a_1}{f_1} \right)^2 + \left(\frac{a_2}{f_2} \right)^2 \right) \quad (2.53)$$

From above analysis: $\beta_j = \frac{1}{f_j} \frac{df_j}{dz}$
Eq(2.53) becomes,

$$\frac{1}{f_j} \frac{d^2 f_j}{dz^2} = \frac{1}{k_j^2 r_{0j}^4 f_j^4} - \left(\frac{1}{2r_{0j}^2} \right) \left(\frac{\omega_p^2}{\omega_j^2 \epsilon_{rj}} \right) \frac{1}{(1 + \frac{a_1^2}{2} + \frac{a_2^2}{2})^{3/2}} \left(\left(\frac{a_1}{f_1} \right)^2 + \left(\frac{a_2}{f_2} \right)^2 \right) \quad (2.54)$$

So, The equations for f_1 and f_2 becomes,

$$\frac{1}{f_1} \frac{d^2 f_1}{dz^2} = \frac{1}{k_1^2 r_{01}^4 f_1^4} - \left(\frac{1}{2r_{01}^2} \right) \left(\frac{\omega_p^2}{\omega_1^2 \epsilon_{r1}} \right) \frac{1}{(1 + \frac{a_1^2}{2} + \frac{a_2^2}{2})^{3/2}} \left(\left(\frac{a_1}{f_1} \right)^2 + \left(\frac{a_2}{f_2} \right)^2 \right) \quad (2.55)$$

$$\frac{1}{f_2} \frac{d^2 f_2}{dz^2} = \frac{1}{k_2^2 r_{02}^4 f_2^4} - \left(\frac{1}{2r_{02}^2} \right) \left(\frac{\omega_p^2}{\omega_2^2 \epsilon_{r2}} \right) \frac{1}{(1 + \frac{a_1^2}{2} + \frac{a_2^2}{2})^{3/2}} \left(\left(\frac{a_1}{f_1} \right)^2 + \left(\frac{a_2}{f_2} \right)^2 \right) \quad (2.56)$$

The second term in RHS of Eq(2.55) and Eq(2.56) represents the nonlinear or self-focusing term and is negative. The first term in RHS represents the diffraction term.

Normalizing distance z to $\zeta = \frac{z}{R_{d1}}$ where $R_{d1} = k_1 r_{01}^2$ and simplifying, we get

$$\frac{d^2 f_1}{d\zeta^2} = \frac{1}{f_1^3} - \left(\frac{f_1}{2} \right) \left(\frac{\omega_p^2}{r_{01}^2 c^2} \right) \frac{1}{(1 + \frac{a_1^2}{2} + \frac{a_2^2}{2})^{3/2}} \left(\left(\frac{a_1}{f_1} \right)^2 + \left(\frac{a_2}{f_2} \right)^2 \right) \quad (2.57)$$

$$\frac{d^2 f_2}{d\zeta^2} = \frac{\omega_1^2}{\omega_2^2} \frac{1}{f_2^3} - \left(\frac{f_2}{2} \right) \left(\frac{\omega_p^2}{r_{02}^2 c^2} \right) \frac{1}{(1 + \frac{a_1^2}{2} + \frac{a_2^2}{2})^{3/2}} \left(\left(\frac{a_1}{f_1} \right)^2 + \left(\frac{a_2}{f_2} \right)^2 \right) \quad (2.58)$$

It is difficult to solve Eq(2.57) and Eq(2.58) analytically, hence we solve it using python's odient function using the boundary conditions:

- (i) At $z = 0, f_1 = f_2 = 1$
- (ii) At $z = 0,$

$$\frac{df_1}{d\zeta} = \frac{df_2}{d\zeta} = 0$$

and for following parameters: $\omega_1 = 1.78 \times 10^{15}$ rad/sec, $r_0 = 10\mu m$, $c = 3 \times 10^8 m/sec$
and for different values of a_1 and a_2 , viz. $a_1 = (1, 1, 0.03)$, $a_2 = (0.01, 0.9, 0.01)$.

Chapter 3

Discussion and Conclusion

3.1 Results

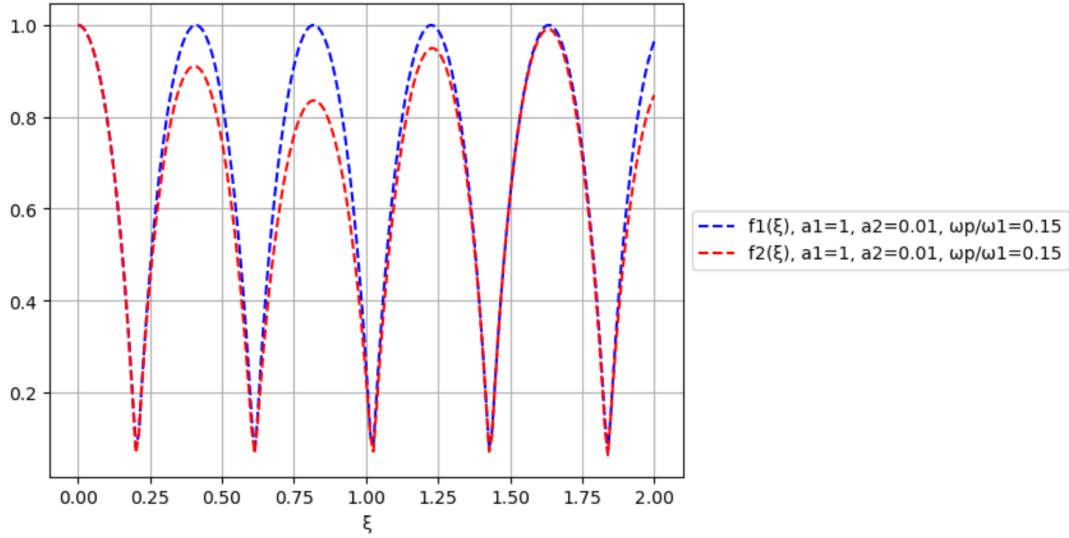


Figure 3.1: Evolution of beam width of Gaussian laser beam with distance of propagation for a_1 relativistic and a_2 non relativistic at fixed values of $r_0 = 10\mu m$, $\frac{\omega_p}{\omega_1} = 0.15$, $w_1 = 1.78 \times 10^{15}$ and $\frac{\omega_2}{\omega_1} = 1.2$

- 1) A plasma channel created by laser one of high power guides laser two of low power.
- 2) When both the lasers are of high intensity, they aid guiding of each other known as mutual guiding or Cross-focusing.
- 3) Self-focusing length increases or decreases with power and the intensity at the focus is enhanced because the intensity is directly proportional to $\frac{1}{f_j^2}$. For instance, if $f_j = 0.1$, then E_0 becomes 100 times its value.

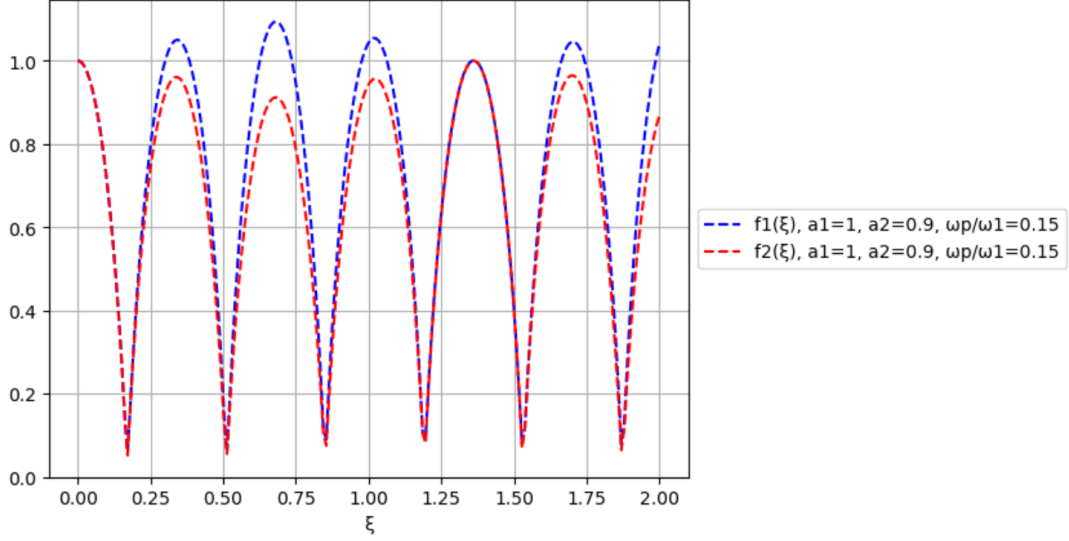


Figure 3.2: Evolution of beam width of Gaussian laser beam with distance of propagation for a_1 relativistic and a_2 relativistic at fixed values of $r_0 = 10\mu m$, $\frac{\omega_p}{\omega_1} = 0.15$, $w_1 = 1.78 \times 10^{15}$ and $\frac{\omega_2}{\omega_1} = 1.2$

This is a big advantage as even if the second laser has small power in the beginning but when it gets self-focused its power becomes quite large. So the nonlinear effect may not be necessary in the beginning but it becomes important at a later stage.

4) When a_1 and a_2 are both non relativistic [in fig(3.3)], the beams first diverge then converge and focusing happens at a very long distance which is not beneficial.

Whereas, when a_1 is relativistic and a_2 is non relativistic [in fig(3.1)], the beams first converge then diverge and the focusing of the beam happens at much shorter distance which is useful in guiding the beams for longer distance.


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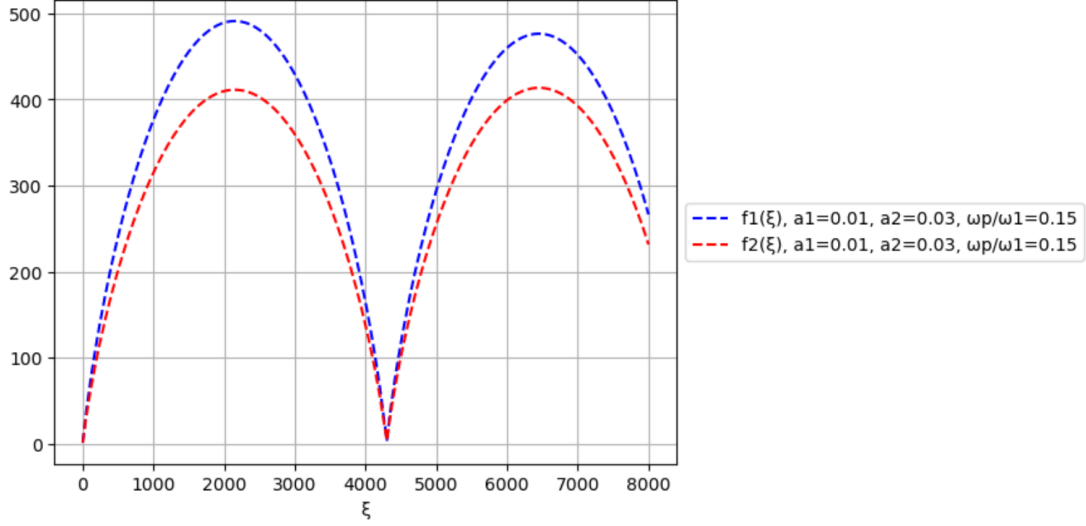
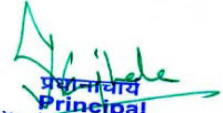


Figure 3.3: Evolution of beam width of Gaussian laser beam with distance of propagation for a_1 non relativistic and a_2 non relativistic at fixed values of $r_0 = 10\mu m$, $\frac{\omega_p}{\omega_1} = 0.15$, $w_1 = 1.78 \times 10^{15}$ and $\frac{\omega_2}{\omega_1} = 1.2$

3.2 Conclusion

In the present work, non linear propagation of Gaussian Laser beams in plasma has been investigated for the phenomenon of Cross-focusing considering Relativistic non linearity. We investigated the process of plasma being formed through the process of tunnel ionization. The channel creation by a high power laser and guiding a low power laser through that non linear channel has been observed. The problem was approached using Paraxial ray approximations and WKB approximations. It was examined that one laser of high power creates a channel of periodic radius, typically equal to $r_0 f_1$, f_1 is a function of z , so the radius keeps on increasing. When a second laser beam even of low power travels in this periodic wave guide, it also gets focused. The physics behind all the results have been tried to be explained.


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Chapter 4

Future Prospects

The current world record for accelerating electrons using laser plasma is approximately 350 MeV, which may not seem impressive when compared to the 50 GeV achieved by the electron/positron beam at SLAC. However, what makes it remarkable is that this level was attained using only a few millimeters of plasma instead of several kilometers of super-cooled accelerator structure. Although laser-plasma accelerators still have a distance to cover before they can rival established facilities, the ability to scale up to Petawatts of power, which is now feasible, will soon turn the tabletop GeV electron accelerator into a tangible reality. The major requirement for that is going to be to produce waveguides for laser beam in plasma that can travel many Rayleigh lengths without getting diffracted.

The researchers today have been able to reach upto 50m optical waveguides by the propagation of femtosecond laser pulses in air [15]. Studies till now are largely confined to single beam focusing, I considered two beam focusing. This research can be further worked upon to find the waveguides to focus multiple beams. The applications are several.



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Terahertz generation by nonlinear mixing of two lasers in capillary plasma in the presence of a magnetic field

A Bachelor's Dissertation Thesis

by

Romana Ruqia

under the supervision of

Dr. Narender Kumar

Submitted to the University of Delhi for the degree of
BACHELORS OF SCIENCE [HONOURS COURSE] PHYSICS



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Certificate

This is to certify that the dissertation project titled “**TeraHertz generation by non-linear mixing of two lasers in capillary plasma in the presence of a magnetic field**” submitted to the **University of Delhi** for the degree of **Bachelors of Science (Honours Course) Physics**, is the record of bona fide research work done by Romana Ruqia under my supervision and guidance.

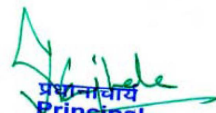
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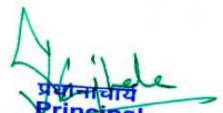
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Abstract

Two laser beams of finite spot size co-propagating through a capillary plasma, modeled as a hollow plasma cylinder, are shown to undergo non-linear mixing and produce a Terahertz (THz) frequency at the inner surface.

When the two lasers of frequency w_1 and w_2 travel with the frequency difference in the Terahertz frequency range, then each laser impart oscillatory velocity to electrons but the Lorentz force (coupling between velocity $\vec{V}$ and magnetic field $\vec{B}$) gives rise to non-linear current and the plasma through the channel, through which the lasers travel together, becomes like an antenna - a non-linear current source that radiates Terahertz radiation.



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Chapter 1

Introduction

1.1 Terahertz Radiation

Terahertz radiation, often referred to as T-rays or sub-millimeter radiation, encompasses electromagnetic waves within a frequency range that falls between microwaves and infrared light. This range typically extends from around 0.3 to 3 terahertz (THz). However, it is worth noting that the upper limit is somewhat subjective, with certain sources considering it to be as high as 30 THz. [1]

Terahertz radiation occupies a unique region of the electromagnetic spectrum and has several distinctive properties. Terahertz waves have relatively long wavelengths, allowing them to penetrate various materials, including clothing, paper, plastics, and ceramics. They possess lower energy than X-rays or gamma rays, making them non-ionizing and safer for biological tissues.

Terahertz radiation can be generated using various techniques. Common

methods include optical rectification, where a laser beam is passed through a nonlinear crystal to produce terahertz waves, and photo-conductive switching, where a semiconductor is illuminated with a laser pulse to generate terahertz radiation.

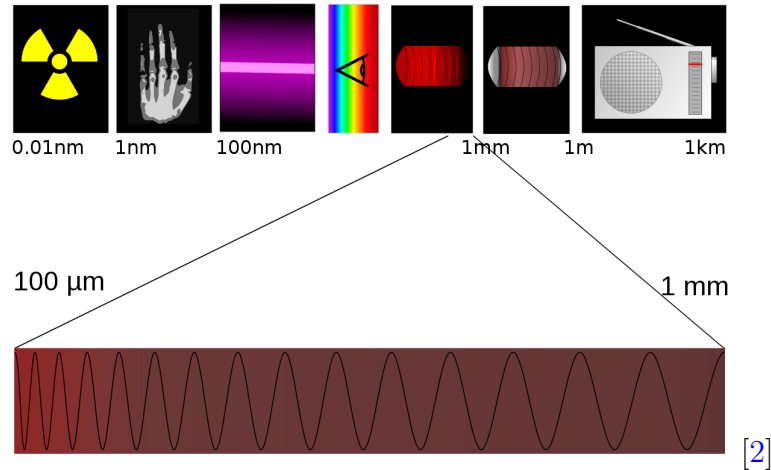


Figure 1.1: Terahertz Radiation in electromagnetic spectrum

While terahertz radiation has promising applications, there are still technical and engineering challenges that need to be addressed for widespread adoption. These include developing efficient terahertz sources, improving terahertz detectors, and addressing concerns related to privacy and safety.

1.1.1 Terahertz Radiation in Astrophysics

THz radiation plays a pivotal role in advancing our understanding of several key aspects of astrophysics. Firstly, it provides valuable insights into the process of star formation. By penetrating dense molecular clouds, THz radiation allows astronomers to observe the thermal emissions from warm dust grains associated with star-forming regions. Analysis of these emissions unveils vital information about the temperature, density, and composition of these regions, shedding light on the intricacies of stellar birth.

Secondly, THz radiation helps unravel the mysteries of the interstellar medium (ISM). By analyzing the spectral signatures of THz emissions from

molecules such as water vapor, carbon monoxide, and complex organic molecules, scientists can determine the composition and distribution of these molecules in different regions of the galaxy. This knowledge aids in understanding the chemical evolution and the processes involved in the formation of stars and planetary systems.

Moreover, THz radiation finds applications in planetary science, where it provides valuable data about planetary atmospheres and surfaces. By studying THz emissions from planetary atmospheres, researchers can glean insights into the presence of water vapor and its role in the planet's hydrological cycle. Additionally, THz radiation facilitates the investigation of planetary surface composition, including the identification of water ice and various minerals.

Furthermore, THz radiation contributes to the study of the cosmic microwave background (CMB) radiation, which offers critical information about the early universe. While the primary range of the CMB lies in the microwave region, a small fraction extends into the THz regime. Utilizing instruments like the Planck satellite, researchers have obtained detailed maps of the CMB across a broad frequency range, including the THz regime. Precise measurements of the THz portion of the CMB enable the determination of fundamental cosmological parameters, such as the age, composition, and expansion rate of the universe.

1.2 Non Linear Optics

Nonlinear optics (NLO) encompasses the study of light behavior in nonlinear media, where the response of the polarization density P to the electric field E deviates from linearity. This non linearity is typically observed at extremely high light intensities, reaching the order of 10^8 V/m, which is comparable to the atomic electric field of 10^{11} V/m and is achievable through laser technology. It is worth noting that beyond the Schwinger limit, even the vacuum is anticipated to exhibit nonlinear characteristics. In the realm of nonlinear optics, the superposition principle no longer remains valid. [3][4][5]

Nonlinear optics explores the intricate connection between the electric field of light and the response of a medium, which exhibits a nonlinear relationship. This response is influenced by various factors including the wavelength, intensity, direction, and polarization of the light.

The interaction between the electric field of light and the electrons and atoms within the medium gives rise to nonlinear behaviors. Under the influence of high-intensity light beams, the atoms within the medium can become ionized, causing alterations in the medium's refractive index and the emergence of new frequencies. These effects give rise to a range of optical phenomena, such as frequency mixing, doubling, optical solitons and parametric amplification.

The advancements in nonlinear optics have played a crucial role in the advancement of terahertz (THz) technology. This progress has enabled the generation of broadband single-cycle THz pulses through a process called optical rectification.

The development of ultra-fast lasers and the continued progress in nonlinear optics have now made it possible to generate intensely powerful single-cycle THz pulses, with peak electric fields surpassing 10^7 V/m. The immense strength of the THz electric field in these ultra-short electromagnetic pulses opens up exciting possibilities for exploring new nonlinear optical effects in the THz spectral range and investigating ultra-fast nonlinear phenomena in the single-cycle regime. [6]

Nonlinear optics explains nonlinear response of properties such as frequency, polarization, phase or path of incident light. These nonlinear interactions give rise to a wide range of optical phenomena one of which, Difference-frequency generation is used in this study.



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1.2.1 Difference-Frequency Generation

Difference-frequency generation (DFG) is an intriguing non-linear optical mechanism that enables the generation of light with a frequency that corresponds to the difference between two distinct frequencies.

In DFG, two input photons with angular frequencies 1 and 2 combine, resulting in the annihilation of these photons, while concurrently generating a single photon at the frequency 3. It is important to note that, as is the case with any phenomenon in nonlinear optics, specific conditions must be met for this process to take place that are:

1. Light should be interacting with matter
2. Light must have a very high intensity (E.g. A pulsed laser).



Figure 1.2: Difference Frequency Generation

Difference frequency generation is a valuable technique employed in the generation of terahertz waves. To achieve efficient terahertz wave generation, specialized photomixers based on semiconductors are utilized. These photomixers operate by utilizing the terahertz beat note generated from two closely matched optical frequencies. This beat note causes oscillations in the carrier density within the semiconductor, which in turn translates into an oscillating current. Finally, this oscillating current gives rise to the emission of terahertz radiation.


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1.3 Capillary Plasma for Terahertz radiation generation

Capillary plasmas are of considerable interest for a variety of applications, such as, optical guiding of high intensity laser pulses [7][8][9][10], soft X-ray generation [11], and in the study of wake field structure [12]. A number of approaches for guiding intense radiation have been employed, including guiding in hollow capillaries, relativistic channeling, and several types of plasma wave guides. Ehrlich et al. [9] have demonstrated optical guiding of high intensity ($> 10^{16} \text{W/cm}^2$) laser pulses in straight and curved plasma channels, where the plasma channel is formed by slow cylindrical capillary discharge. More than 7.5% of the laser pulse energy propagates up to 11 Rayleigh lengths. Recently Butler et al. [10] have observed guiding of laser pulses with a peak input intensity above 10^{17}W/cm^2 in a hydrogen-filled capillary discharge wave-guide.

The pulse is guided with low coupling and propagation losses, and with little spectral or temporal distortion, over lengths up to 50 mm, corresponding to 42 times the measured Rayleigh length. This device is well suited for applications, such as laser wake field acceleration, requiring the propagation of intense laser pulse through fully ionized plasma. Dorchies et al. [13] have observed monomode guiding over 100 Rayleigh lengths (10 cm) of an ultra short laser pulse at intensities up to 10^{16}W/cm^2 without inner wall glass breakdown in hollow dielectric capillary tubes.

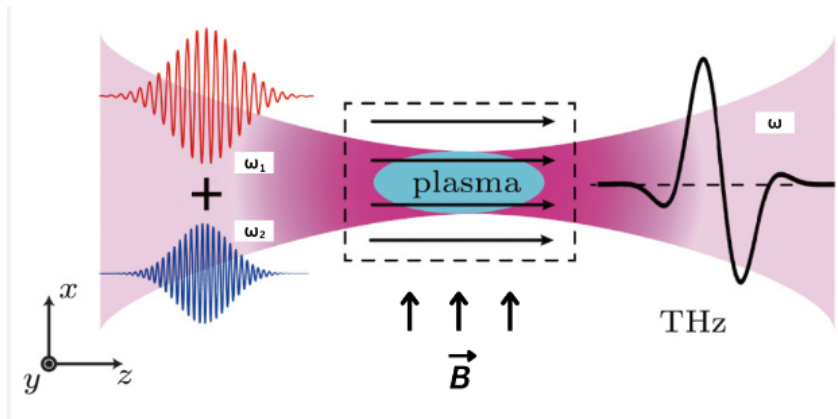
Two collinear Gaussian laser beams with frequencies much above the plasma frequency propagate along the cylinder axis and extend radially outward into the plasma region. The lasers impart oscillatory velocity to plasma electrons and exert a ponderomotive force on them at the beat frequency. The ponderomotive force has a transverse component that drives nonlinear current, producing THz radiation. The lasers also exert a static radial ponderomotive force that keeps the plasma from creeping in i.e static component of ponderomotive force inhibits plasma from filling the vacuum region while beat frequency component produces a non linear current (J^{NL}) that drives the difference frequency THz surface plasma wave (SPW). [14]

Phase matching for THz surface wave excitation is achieved when the group velocity of the lasers equals the phase velocity of the beat frequency SPW.



[15]

Figure 1.3: Capillary Plasma



[16]

Figure 1.4: Two lasers co-propagating inside capillary plasma

1.4 Ponderomotive Force

The ponderomotive force is a nonlinear force experienced by a charged particle when subjected to an oscillating electromagnetic field with spatial variations. Unlike in a homogeneous field where the particle oscillates around an initial point, this force causes the particle to migrate towards regions of weaker field strength.

This phenomenon arises due to the particle perceiving a stronger force magnitude during the half of the oscillation period when it resides in the area with a stronger field. Although the net force during its presence in the weaker field area during the second half of the oscillation does not fully counterbalance the net force experienced in the first half, resulting in an overall movement towards the region with lesser force over a complete cycle.

The ponderomotive force F_p is given by:

$$F_p = -\frac{e^2}{4mw^2} \nabla(E^2) \quad (1.1)$$

which is quantified in newtons (in SI units)

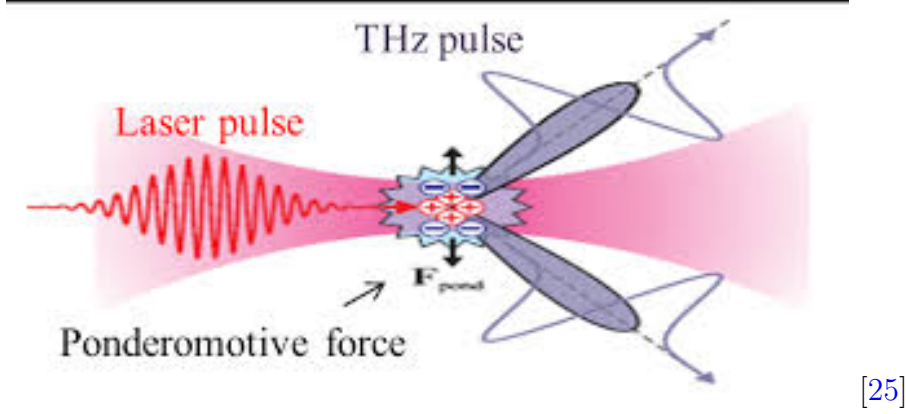


Figure 1.5: Ponderomotive force generation by laser plasma interaction

In this equation, e represents the electrical charge of the particle, m denotes its mass, ω represents the angular frequency of the field's oscillation, and E indicates the amplitude of the electric field. It is important to note that at sufficiently low amplitudes, the magnetic field exerts minimal force. This equation signifies that a charged particle experiencing an inhomogeneous oscillating field not only oscillates at the frequency of the field but also undergoes acceleration due to the ponderomotive force, which propels it towards the direction of weaker field strength. Notably, in this particular scenario, the direction of the force remains unaffected by the sign of the charge on the particle, as indicated by the equivalence of:

$$((-e)^2 = (+e)^2)$$

1.4.1 Ponderomotive Potential

The ponderomotive potential, also known as the ponderomotive energy or ponderomotive potential energy, arises from the interaction between charged particles and an oscillating electromagnetic field. It represents the average potential energy experienced by a charged particle in the presence of the field.

When considering a system of charged particles under the influence of the ponderomotive force, it is possible to have a gas of such particles confined by this force. This collection of charged particles is referred to as plasma. In the presence of an oscillating field, the distribution function and density of the plasma will exhibit fluctuations at the frequency of the applied oscillation. Obtaining an exact solution requires solving the Vlasov Equation. However, it is often assumed that the time-averaged density of the plasma can be directly obtained by considering the expression of the force governing the drift motion of individual charged particles as: [??]

$$\bar{n}(x) = n_0 \left[-\frac{e}{k_B T} \Phi_p(x) \right]$$

here Φ_p is the ponderomotive potential and is given by:

$$\Phi_p(x) = \frac{m}{4w^2} [g(x)]^2 \quad (1.2)$$



Chapter 2

Theoretical and Numerical Analysis

2.1 Effect of magnetic field in production of Tera-Hertz Radiation

When two co-propagating lasers are incident on a glass capillary tube, it results in the creation of plasma with which the lasers react. This electrostatic plasma wave produced by the non-linear mixing of the two laser waves of frequencies w_1 and w_2 , and wave vectors k_1 and k_2 respectively. The generated wave plasma wave has frequency w and wave vector .

$$w = w_1 - w_2$$
$$\vec{k} = \vec{k}_1 - \vec{k}_2$$

The process takes place effectively when $w \approx w_p$ i.e the plasma frequency of the plasma.

Lasers can not generate an electromagnetic wave because;

- $w, \vec{k}$ do not satisfy electromagnetic wave dispersion relation.
- Ponderomotive force generates a longitudinal current ($J^{NL} \parallel \vec{k}$), hence cannot give rise to excitation of transverse radiation.

The situation changes favourably when a plasma has a density ripple $n_q = n_{q0} e^{\iota(q_x x + q_z z)}$, created by using a laser beam.

Under the ripple, $\vec{k}$ of the terahertz wave is $\vec{k} = \vec{k}_1 - \vec{k}_2 - \vec{q}$ which can satisfy linear dispersion relation -

$$k^2 = \frac{\omega^2}{c^2} \left(1 - \frac{\omega_p^2}{\omega^2} \right) \quad (2.1)$$

The non linear current has finite transverse component, perpendicular to $\vec{k}$ that produces electromagnetic Terahertz radiation

2.2 Terahertz production by non-linear mixing of lasers in capillary plasma in the presence of magnetic field

Considering two laser beams launched into the capillary with magnetic field as -

$$\vec{B}_1 = \hat{x} \frac{k_1 A_1}{\omega_1} e^{-\iota(\omega_1 t - k_1 z)} \quad (2.2)$$

$$\vec{B}_2 = \hat{x} \frac{k_2 A_2}{\omega_2} e^{-\iota(\omega_2 t - k_2 z)} \quad (2.3)$$

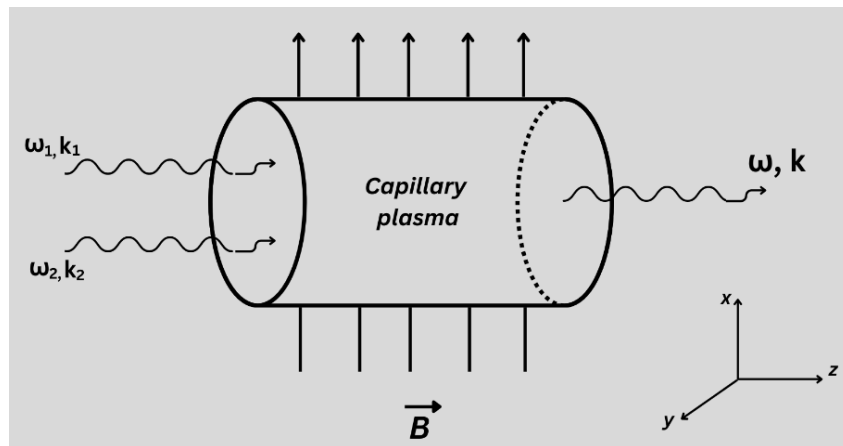


Figure 2.1: THz production by non linear mixing of lasers in the presence of magnetic field

These lasers impart oscillatory velocities to electrons;

$$\vec{V}_j = \frac{e\vec{E}_j}{m\omega_j} \quad (j = 1, 2, 3...) \quad (2.4)$$

They also experience a ponderomotive force;

$$\vec{F}_w = -\frac{e}{2}(\vec{V}_1 \times \vec{B}_2^* + \vec{V}_2 \times \vec{B}_1^*) \quad (2.5)$$

Using this equation of motion we obtain oscillatory electron velocity at ω

$$\begin{aligned} m \frac{\partial \vec{V}_w}{\partial t} &= \vec{F}_w \\ \Rightarrow \vec{V}_w &= -\frac{\vec{F}_w}{m\omega} \end{aligned} \quad (2.6)$$

This velocity has frequency ω and wave number $k_1 - k_2$. It beats with static density ripple n_q to produce non-linear current at ω, k where $k = k_1 - k_2 - q$.

$$J_{w,k}^{\vec{N}L} = -\frac{1}{2}n_q^* e \vec{V}_w \quad (2.7)$$

The equation of motion then becomes;

$$m \frac{d\vec{V}_w}{dt} = -\frac{e}{2}(\vec{V}_{w_1} \times \vec{B}_{w_2} + \vec{V}_{w_2} \times \vec{B}_{w_1}) - m\nu \vec{V}_w - (e\vec{V}_w \times \vec{B}_s) \quad (2.8)$$

Dividing both sides by m we get -

$$\begin{aligned} \frac{d\vec{V}_w}{dt} &= -\frac{e}{m}\vec{E}_w + \frac{\vec{F}_{pw}}{m} - \nu \vec{V}_w - \frac{e}{m}\vec{V}_w \times \vec{B}_s \\ \Rightarrow -\omega \vec{V}_w &= -\frac{e}{m}\vec{E}_w + \frac{\vec{F}_{pw}}{m} - \vec{V}_w \times \vec{B}_s \end{aligned} \quad (2.9)$$

Solving linearized equation of motion;

$$\begin{aligned} \vec{V}_{w_1} &= \frac{e\vec{E}_{w_1}}{m\omega_1} \\ \vec{V}_{w_2} &= \frac{e\vec{E}_{w_2}}{m\omega_2} \end{aligned}$$

2.2.1 Ponderomotive Force

For non linear, we obtain the y and z component i.e. V_{wy} and V_{wz}

y component:

$$-\iota w V_{wy} = -V_{wz} x w_c + \frac{F_{py}}{m} \quad (2.10)$$

z component:

$$-\iota w V_{wz} = V_{wy} x w_c + \frac{F_{pz}}{m} \quad (2.11)$$

Multiply 2.11 by $\pm \iota$ and add to 2.10

$$V_{wy}^{NL} + \iota V_{wz}^{NL} = \frac{1}{-\iota(w + w_c)} \frac{F_{py} + \iota F_{pz}}{m} \quad (2.12)$$

$$V_{wy}^{NL} - \iota V_{wz}^{NL} = \frac{1}{-\iota(w - w_c)} \frac{F_{py} - \iota F_{pz}}{m} \quad (2.13)$$

The ponderomotive force along y and z is given by;

$$F_{py} = -\frac{m}{2} \nabla_y (V_{w1} \cdot V_{w2}^*)$$

$$F_{pz} = -\frac{m}{2} \nabla_z (V_{w1} \cdot V_{w2}^*)$$

Using $\nabla_y = -\frac{2y}{r_0^2}$, $\nabla_z = \iota(k_1 - k_2) = \iota k$ and linear equation of motion, the ponderomotive force is obtained as -

$$F_{py} = \frac{y}{r_0^2} \left[\frac{e^2 \vec{E}_{w1} \vec{E}_{w2}^*}{m w_1 w_2} \right] \quad (2.14)$$

$$F_{pz} = -\frac{\iota k}{2} \left[\frac{e^2 \vec{E}_{w1} \vec{E}_{w2}^*}{m w_1 w_2} \right] \quad (2.15)$$

2.2.2 Formulation of non linear velocity and non linear current density

Non linear velocity:

We use the observed values of Ponderomotive force in 2.12 and 2.13;

$$V_{wy}^{NL} + \iota V_{wz}^{NL} = \frac{1}{-\iota m(w + w_c)} \left[\frac{e^2 \vec{E}_{w_1} \vec{E}_{w_2}^*}{mw_1 w_2} \right] \left[\frac{y}{r_0^2} + \frac{k}{2} \right] \quad (2.16)$$

$$V_{wy}^{NL} - \iota V_{wz}^{NL} = \frac{1}{-\iota m(w - +w_c)} \left[\frac{e^2 \vec{E}_{w_1} \vec{E}_{w_2}^*}{mw_1 w_2} \right] \left[\frac{y}{r_0^2} - \frac{k}{2} \right] \quad (2.17)$$

Adding and Subtracting the two equations we obtain -

$$V_{wy} = \frac{e^2 \vec{E}_{w_1} \vec{E}_{w_2}^*}{-\iota m^2 w_1 w_2 (w^2 - w_c^2)} \left[\frac{wy}{r_0^2} - \frac{k w_c}{2} \right] \quad (2.18)$$

$$V_{wz} = \frac{e^2 \vec{E}_{w_1} \vec{E}_{w_2}^*}{m^2 w_1 w_2 (w^2 - w_c^2)} \left[\frac{wk}{2} - \frac{y w_c}{r_0^2} \right] \quad (2.19)$$

Non linear current:

$$\therefore J^{\vec{NL}} = -\frac{1}{2} n_q^* e V_w^{NL},$$

$$\therefore J_{wy} = -\frac{1}{2} n_q^* e \left[\frac{e^2 \vec{E}_{w_1} \vec{E}_{w_2}^*}{-\iota m^2 w_1 w_2 (w^2 - w_c^2)} \right] \left[\frac{wy}{r_0^2} - \frac{k w_c}{2} \right]$$

$$J_{wz} = -\frac{1}{2} n_q^* e \left[\frac{e^2 \vec{E}_{w_1} \vec{E}_{w_2}^*}{m^2 w_1 w_2 (w^2 - w_c^2)} \right] \left[\frac{wk}{2} - \frac{y w_c}{r_0^2} \right]$$

Additionally,

$$\begin{aligned} \vec{E}_{w_1} \vec{E}_{w_2}^* &= A_{01} A_{02} e^{-\frac{r^2}{r_0^2}} e^{-\iota(wt - kz)} \\ \Rightarrow J_{wz} &= -\frac{1}{2} \frac{n_q^* e^3 A_{01} A_{02}}{m^2 w_1 w_2 r_0^2} e^{-\frac{r^2}{r_0^2}} e^{-\iota(wt - kz)} \left[\frac{w k r_0^2}{2} - y w_c \right] \end{aligned} \quad (2.20)$$

2.2.3 THz radiation generation from short antenna

The vector potential obtained from the non linear current is denoted by $\vec{A}(r, t)$. Although there is a concept of time delay which arises as the laser wave takes a certain amount of time to travel to the observer. Therefore, the vector potential is calculated by considering the non linear current at time $t - \frac{r}{c}$ i.e some time before time t .

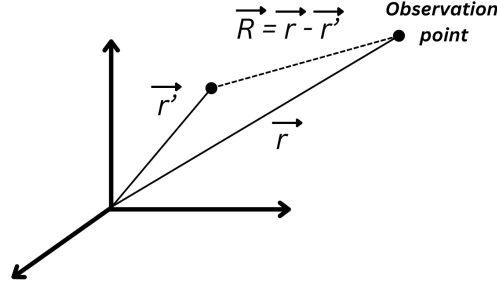


Figure 2.2

In addition to this, the integration of non linear current to get the vector potential at a point of observation is done under the limit where the non linear current is finite i.e inside the cylindrical capillary (which acts as an antenna).

From the figure, it is noted that $\vec{A}$ at distance $\vec{r}$ due to $\vec{J}^{NL}$ at $\vec{r}'$ is dependent on $\vec{R}$.

$$\begin{aligned} R &= |\vec{r} - \vec{r}'| \\ &= (r^2 + r'^2 - 2\vec{r} \cdot \vec{r}')^{\frac{1}{2}} \\ &= r \left(1 - \frac{2\vec{r} \cdot \vec{r}'}{r^2} \right)^{\frac{1}{2}} \end{aligned}$$

Using Binomial expansion,

$$\approx r \left(1 - \frac{\vec{r} \cdot \vec{r}'}{r^2} \right)$$

$$\Rightarrow R = r - \frac{\vec{r} \cdot \vec{r}'}{r}$$

As $\vec{r} \cdot \vec{r}' = xx' + yy' + zz'$, we use cylindrical and spherical polar coordinates

-

Cylindrical polar coordinates -

$$x' = r' \cos \phi', \quad y' = r' \sin \phi', \quad z'$$

Spherical polar coordinates -

$$x = r \sin \theta \cos \phi, \quad y = r \sin \theta \sin \phi, \quad z = r \cos \theta$$

$$\Rightarrow R = r - \frac{1}{r} [rr' \sin \theta \cos \phi \cos \phi' + rr' \sin \theta \sin \phi \sin \phi' + rz' \cos \theta]$$

$$\therefore R = r - [r' \sin \theta \cos(\phi' - \phi) - z' \cos \theta] \quad (2.21)$$

Hence, the vector potential obtained is -

$$\vec{A}(r, t) = \frac{\mu_0}{4\pi} \int \frac{\vec{J}(r', t - \frac{R}{c})}{R} dV \quad (2.22)$$

$$\vec{A}(r, t) = \frac{\mu_0}{4\pi} \int \frac{1}{2R} \frac{n_q^* e^3 A_{01} A_{02}}{m^2 w_1 w_2 r_0^2} \frac{e^{-\frac{r'^2}{r_0^2}} e^{-\iota(wt - kz')}}{(w^2 - w_c^2)} \left[\frac{wkr_0^2}{2} - y' w_c \right] dV \quad (2.23)$$

Putting all the obtained values

$$\begin{aligned} \vec{A}(r, t) &= \frac{\mu_0}{4\pi} \left[\frac{n_q^* e^3 A_{01} A_{02}}{m^2 w_1 w_2 r_0^2} \right] \left[\frac{e^{-\iota(wt - wr/c)} w_c}{(w^2 - w_c^2)} \right] \\ &\int_0^{2\pi} \int_0^l \int_0^a \left[e^{-\frac{r'^2}{r_0^2}} e^{-\iota \frac{w}{c} (r' \sin \theta \cos(\phi' - \phi) + z' \cos \theta)} e^{\iota k z'} r' \right] dr' dz' d\phi' \end{aligned} \quad (2.24)$$

The integral term can be written as -

$$\int_0^{2\pi} \int_0^l \int_0^a \left[e^{-\frac{r'^2}{r_0^2}} e^{-\iota \frac{w}{c} (r' \sin \theta \cos(\phi' - \phi) + z' \cos \theta)} e^{\iota k z'} r' \right] dr' dz' d\phi'$$

The integral is then solved to obtain the vector potential.

The magnetic field $\vec{B}$ can also be calculated using $\nabla \cdot \vec{A} = -\frac{\iota w}{c}(\hat{r} \times \vec{A})$

Poynting Vector -

$$\vec{S}_{avg} = \frac{\vec{B} \cdot \vec{B}^*}{2\mu_0} c \hat{r}$$

This quantity is normalized to obtain this form -

$$\begin{aligned} \frac{S_{avg}}{S_1} &= \frac{1}{32} \left(\frac{n_q}{n_0} \right)^2 \left(\frac{eA}{mwc} \right)^2 \left(\frac{w_p}{w_1} \right)^2 \left(\frac{w_p}{w_2} \right)^2 \left(\frac{w}{w_c} \right)^2 \frac{1}{[1 - (\frac{w_c}{w})^2]^2} \\ &\times \frac{1}{\left(\frac{Rw}{c} \right)^2} \left[\frac{1 - \text{Cos} \left[\frac{wl(\text{Cos}\theta - k)}{c} \right]}{(\text{Cos}\theta - k)} \right] \times \left[1 - e^{-a^2/r_0^2} - \frac{w^2}{4c^2} r_0^2 \text{Sin}^2\theta \left(1 + \frac{a^2}{r_0^2} \right) \right] \text{Sin}^2\theta \end{aligned} \quad (2.25)$$

Furthermore, power of the laser is obtained by

$$\begin{aligned} P_{La} &= S_{avg} \times (\text{area}) = S_{avg} \times \pi a^2 \\ \Rightarrow P_{La} &= \frac{1}{32} \left(\frac{n_q A_{01} A_{02} e^3}{m^2 w_1 w_2 \epsilon_0} \right)^2 \frac{c}{2} \pi a^2 \frac{w^2}{(w_c^2)^2} \frac{1}{[1 - (\frac{w_c}{w})^2]^2} \frac{1}{\left(\frac{Rw}{c} \right)^2} \\ &\times \left[\frac{1 - \text{Cos} \left[\frac{wl(\text{Cos}\theta - k)}{c} \right]}{(\text{Cos}\theta - k)} \right] \times \left[1 - e^{-a^2/r_0^2} - \frac{w^2}{4c^2} r_0^2 \text{Sin}^2\theta \left(1 + \frac{a^2}{r_0^2} \right) \right] \text{Sin}^2\theta \end{aligned} \quad (2.26)$$



2.3 Results

To obtain the result, the CO_2 lasers are taken with frequencies $w_1 = 2.2 \times 10^{15}$ rad/sec, $w_2 = 2.2 \times 10^{15}$ rad/sec. The corresponding wavelengths will be $\lambda_1 = 0.9 \mu m$ and $\lambda_2 = 0.8 \mu m$. The magnetic field is taken in the order of 10^5 G. The peak intensity is taken is 10^4 W/m².

$$\frac{eA}{mwc} = 0.8, \frac{n_q}{n_0} = 0.3,$$

$$\frac{w_p}{w_1} = 20, \frac{w_c}{w} = 0.9, \frac{a}{r_0} = 2, r_0 = 5 \mu m,$$

$$R = 1 cm, L = 10a, \theta = \frac{\pi}{2}$$

Plotting the graph

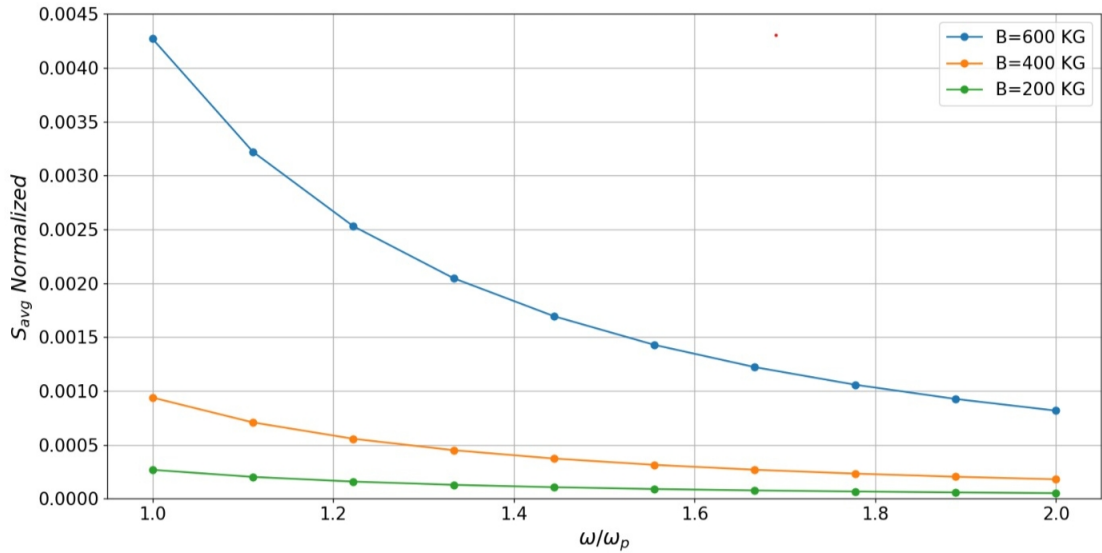


Figure 2.3

The result obtained shows that the output laser power is 10^{-3} times compared to the input laser power. When Terahertz frequency w is equal to the plasma frequency w_p . Additionally as the magnetic field increases, THz power also increases and obtains a maximum value at a higher magnetic field.

The static density ripple n_q^* is included as it enhances a higher yield to get proper phase matching. The amplitude of THz resonantly depends on wave number and the factor q .

Chapter 3

Discussion and Conclusion

At certain angles, the THz antenna created by the non linear of two lasers, gives a large THz radiation. The behaviour of this radiation with w is studied along with the ratio of power conversion i.e by how many orders the magnitude s smaller. This is generally found out to be $10^{-3} / 10^{-4}$. In some cases, it may be obtained a little less and in such cases, the power can be enhanced if we consider an antenna array.

To create a plasma channel, capable of guiding THz radiation, one needs laser spot size $r_0 > c/w_p$. The THz spot size decreases with increasing laser amplitude as more electrons are expelled from axial region. The phase matching condition for resonant THz generation by non linear mixing of lasers is satisfied at a specific ratio of THz frequency to plasma frequency w_p . The frequency of resonant THz excitation decreases with the laser intensity.

In case of short pulses, THz in the main body of the pulse is produced by the ponderomotive force induced current.



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Chapter 4

Future Prospects

The future prospects for developing terahertz (THz) radiation through nonlinear mixing of lasers in capillary plasma under the effect of magnetic field are highly promising. This approach leverages the unique properties of plasma and the nonlinear optical effects that occur in the semiconductor material.

The use of capillary plasma as the nonlinear medium offers several advantages for THz generation and the development of THz radiation through nonlinear mixing in capillary plasma holds immense potential for future applications. THz waves have unique properties that make them valuable for numerous fields, including communications, imaging, spectroscopy and sensing.

1. Thz radiation can be used increasingly in detection of explosives like RDX, which have their vibration in the THz range. Therefore, if such radiation falls on them, it gets deflected thereby indicating the presence of such materials.
2. THz radiation can also be used to perform medical diagnosis which is otherwise done through x-rays. If the power of radiation is significantly high, it can be used to detect problems inside the human body as its photon energy is much lesser than that of the x-rays and hence it is comparatively very less harmful on human issues hence dismissing chances of bad impacts on the body.

3. THz radiation can even be used in the field of astrophysics to detect the presence of water in unknown regions through spectroscopy.

Researchers are continuously exploring novel approaches to enhance the efficiency, power, and tunability of THz sources based on nonlinear mixing in capillary plasma. Advances in laser technology, waveguide design, and resonant cavity structures are expected to contribute to further improvements in THz generation. Additionally, efforts to optimize the performance of capillary plasma based materials will aid in pushing the boundaries of THz radiation generation.

In conclusion, the future prospects for developing THz radiation using nonlinear mixing of lasers in capillary plasma under the effect of magnetic field are highly promising. This approach capitalizes on the unique properties of plasma antenna, enabling efficient and tunable THz generation for a wide range of applications. Ongoing research and technological advancements are anticipated to unlock even greater potential for THz technologies in the coming years.



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August 5, 2024

Internship Certificate

Dear Abdul Khan,

This is to certify that you interned with D. E. Shaw India Private Limited from **June 10, 2024** to **August 2, 2024** with the **FinRes** department.

During your internship, you worked on the project '**Indian Aviation Industry Analysis**'.

We wish you all the best in your future endeavors.

Sincerely,

Digitally signed by
NETRA CHETAN PURANIK

Netra Puranik
Director - Human Capital



India Offices

Registered:

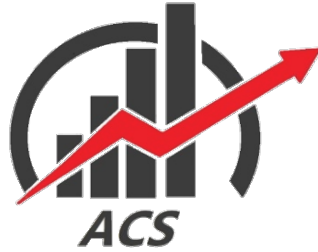
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AGILE CAPITAL SERVICES

OFFER LETTER

Date: 24 Nov, 2023

Dear Harsh Rawat

College name - Sri Venkateswara College

On behalf of **Agile Capital Services**, We are pleased to offer you the position of **Intern** with our company. Hope you will perform your best. All of us at **ACS** are excited that you would be joining our team!

Please find below, details regarding your internship:

Department: Marketing And Finance

Date of Joining: 31 Jan, 2024

Office location: Delhi/Work from Home

For any queries please feel free to write us at: **hr@agilecapitalservices.com**

Best Wishes!!



(Authorized Signatory)
HR Department
Agile Capital Services Pvt. Ltd.

RG Trade Tower, Netaji Subhash Place, Pitampura, New Delhi- 110034

Email: info@agilecapitalservices.com

www.agilecapitalservices.com



All India ITR

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INTERNSHIP CERTIFICATE

This is to certify that **Tamanna Kumar** was working with us at Corwhite Solutions Pvt Ltd in one of the Project “ALL INDIA ITR” Taxation department as an “Intern – Tax Expert” from 3rd June 2024 to 31st July 2024.

During her tenure with us she was smart, hardworking and a team player. She has worked to the best of her capabilities and shown tremendous efforts in learning.

We wish her all the best in her future endeavors!

Akansha

(Assistant Manager-HR)

CORWhite
CORWHITE SOLUTIONS PVT. LTD.

Office Address: Unit - 23A, 238 & 24, Spaze iTech Park, Tower 82, Sohna Rd, Sector 49, Gurugram, Haryana 122018

E-mail: info@corwhite.com, **Website:** www.allindiaitr.com

Phone: (0)124-4201791

Rural Handmade

Creating Sustainable supply chains of
handmade products for small businesses



Regd. Office: Rural Handmade
12 Langbourne Place, London, E143WN
+44 7456176631, www.ruralhandmade.com
Email: Hr@ruralhandmade.com

Date: 29/01/2024

TO WHOMSOEVER IT MAY CONCERN

This is to proudly certify that **Anshika Vats from University of Delhi** has shown outstanding dedication and accomplished remarkable achievements throughout their enriching journey as **Human Resource Intern** intern at **Rural Handmade**. This remarkable experience took place from **12/02/2024 to 12/05/2024**, leaving a lasting positive impact on our team and organization.

During the internship period, she demonstrated an insatiable curiosity and a passion for learning. she actively engaged in various challenging projects, showcasing remarkable problem-solving skills and a strong sense of initiative.

In the course of the internship, she completed the following tasks:

- Actively engaged in comprehensive research activities for the placement cell of multiple colleges situated in Delhi, Bangalore, and Chennai, contributing valuable insights and recommendations.
- Demonstrated proficiency in conducting interviews for candidates hailing from diverse academic backgrounds, encompassing both Indian and international universities, thereby aiding in the selection process.
- Successfully represented Rural Handmade at the internship fair hosted by Sri Venkateswara College, actively participating in interviews and effectively showcasing the organization's objectives and initiatives.
- Took the initiative in organizing and facilitating various meetings and team bonding sessions among fellow interns, fostering a collaborative and cohesive work environment conducive to productivity and mutual growth..

We extend our heartfelt congratulations for their achievements and express our sincere gratitude for the remarkable dedication she exhibited during their tenure with us. May this accomplishment serve as a stepping stone to a bright and promising future. We have no doubt that she will continue to achieve greatness and leave a positive impact wherever they go.

Konark Ogra



KOHLI MEDIA LLP PROUDLY AWARDS

CERTIFICATE

OF INTERNSHIP TO

Anshika Vats

For Successfully completing the 3 Months Internship at Kohli Media LLP from
25 June 2024 - 25 September 2024 as a People Engagement Assistant
in Human Resource (HR).

30 September 2024

Date

Komal

Signature

OFFER LETTER

Date: 20 Jul, 2024

Dear Anshika Vats

College name - Sri Venkateswara College

On behalf of **Zielhoch**, We are pleased to offer you the position of **Intern** with our company.

Hope you will perform your best. All of us at **Zielhoch** are excited that you would be joining our team!

Please find below, details regarding your internship:

Department: Marketing And Finance

Date of Joining: 28 Jul, 2024

Office location: Work from Home

For any queries please feel free to write us at: **hr@zielhoch.com**

Best Wishes!!



(Authorized Signatory)

HUMAN RESOURCE

Zielhoch

CERTIFICATE OF INTERNSHIP

kamarth

This Certificate is Awarded to

Deepa

*in recognition of her/his hard work, dedication and punctuality in
completing all the assigned tasks as **Human Resources Intern** from
4th March 2024 to 3rd June 2024*



Founder



Issued On:
June 27 , 2023

Presents this

CERTIFICATE

OF INTERNSHIP TO

Deepa

for his/her successful completion of the internship programme at FinChase for the
role Finance and Marketing Intern from March 15, 2023, to June 15, 2023.

We wish you success in all of your future endeavours!

A handwritten signature in black ink, appearing to read "Prateek Bansal".

Prateek Bansal
(Co-founder, FinChase)



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12th September, 2023

TO WHOM SO EVER IT MAY CONCERN

This is to certify that **Mr. Ritesh** has completed an internship in Uni Square Concepts as a **Digital Marketing Trainee** from **1st June, 2023 to 4th September, 2023**.

During his tenure, Ritesh explored and developed his skills in diverse areas of Digital Marketing. He worked on projects involving Off Page SEO, Formatting of E-Books, Social Media Marketing and Video Editing. He is a quick learner and was able to adapt to the dynamic work environment. Ritesh worked sincerely with Uni Square Concepts, always acting as a part of the team. His management skills are also commendable. They were very well reflected in the various projects that he was able to execute for the company.

We wish him all the best for his future endeavors.

For Uni Square Concepts

Uday Senthil

Authorized Signatory

UNI SQUARE CONCEPTS
G-73/B, Basement, Kalkaji,
New Delhi-110019





THE AARAMBH ORGANISATION

A Non-Governmental Organisation



NITI Aayog

UNIQUE ID: RJ/2022/0309120

CERTIFICATE

OF APPRECIATION

This certificate is proudly awarded to

Ritesh

**for successfully completing an internship as a member of
The Aarambh Organisation and contributing sheer
hardwork and dedication**

ADITYA APURVA

PRESIDENT

JEETU CHOUDHARY

FOUNDER





UIN: YHR001183

CERTIFICATE OF EMINENCE

This certificate is proudly presented to

RITESH

for successfully completing
HR Internship as HR recruiter intern on 8th May
YoursthatSenior (P) Ltd for a tenure of **one month**.

Mohit Kadayan
Founder & CEO

Aman Meena
Head of corporate
Affairs & operations



Verified on
13/05/2023



CERTIFICATE OF COMPLETION

This certificate is awarded to

RITESH

for completing one month online Internship Program as an

Intern – Talent Acquisition

at Erekrut - a pre-hiring assessment Job Portal on

February 28, 2023



RAVINDER GOYAL

Co-Founder/MD



AJAY GOYAL

Co-Founder & CEO

<https://www.erekrut.com/> is a premium online pre-hiring assessment job portal.



CERTIFICATE OF COMPLETION

THIS IS TO CERTIFY THAT

Simone Kalsi

*Has Completed 90 days of internship in CSR Management with
Renukiran Welfare Foundation*



Director



10-Dec-2023

Date

CERTIFICATE OF COMPLETION

Date: 12 Apr, 2024

This certificate is awarded to

Ms. Simone Kalsi

in appreciation for her successful work as an intern in Zielhoch Company.

She has completed her Winter Internship with project title

"Marketing And Hr"

Under the guidance of

Mr. Shashank Rao

Project duration
15 Jan, 2024 to 15 Mar, 2024

The internship assessment fulfils the stated criteria and student findings are her original work.

We hereby certify her work satisfactory to the best of my knowledge with an aggregate
Grade A

Location for internship-
Delhi - NCR / Work from Home

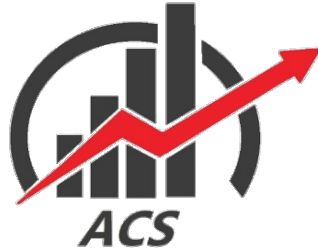
We wish her all the best for future endeavours.

Warm Regards



(Authorized Signatory)
HUMAN RESOURCE
Zielhoch

Konark Ogra
Founder
Rural Handmade



AGILE CAPITAL SERVICES

COMPLETION CERTIFICATE

Date: 10 Sep, 2024

This is to certify that

Ms. Khushi

has successfully completed her Summer Internship with project title

"Marketing And Hr Strategies"

Under the guidance of

Mr. Arpit Panwar

Project duration

05 Jul, 2024 to 05 Sep, 2024

The internship assessment fulfils the stated criteria and student findings are her original work.

We hereby certify her work satisfactory to the best of my knowledge with an aggregate

Grade 60

Location for internship-

New Delhi/Work from Home

We wish her all the best for future endeavours.

Warm Regards



(Authorized Signatory)

HR Department

Agile Capital Services Pvt. Ltd.

RG Trade Tower, Netaji Subhash Place, Pitampura, New Delhi- 110034

Email: info@agilecapitalservices.com

www.agilecapitalservices.com



प्रो० रंजन कुमार त्रिपाठी
Prof. Ranjan Kumar
Tripathi
अधिष्ठाता, छात्र कल्याण
Dean Students' Welfare

अधिष्ठाता, छात्र कल्याणकार्यालय
Dean Students' Welfare Office
दिल्लीविश्वविद्यालय, दिल्ली-110007
University of Delhi, Delhi-110007

Annexure D

The Office of Dean Students' Welfare
Vice-Chancellor Internship Scheme: Summer Internship 2024

Joining Letter

I Mehak Chopra of Sri Venkateswara College Deptt/ Centre/
Institute B.Com (Hons.) Course 4th Semester hereby join the Vice-
Chancellor Internship Scheme: Summer Internship 2024 as an intern.

I have been assigned the Finance Office to attend to the
official responsibilities under the supervision of the Reporting Officer there.

I have read the terms and conditions of the internship program and will abide by the rules of
the Vice-Chancellor Internship Scheme at the University of Delhi.

Mehak Chopra
Signature of the Student
Date: 12/06/2024
Mobile no: 6006287661

Joint Dean,
DSW, University of Delhi

Signature with Seal
Dean/ HoD/ Director

Note: The Reporting Officer must kindly forward a duly signed copy of this Joining Letter by the
Dean/ HoD/ Director within five working days to the DSW office.



CERTIFICATE OF COMPLETION

IS PRESENTED TO :

Bhumika Singh

has completed her internship as a **Client Relations Intern** at Mastork
from **July 03rd 2024 to August 31st 2024.**

We wish you all the best for her upcoming endeavours.

Dhruv Garg

Dhruv Garg

CHIEF EXECUTIVE OFFICER



CERTIFICATE OF COMPLETION

IS PRESENTED TO :

Sneha Tyagi

has completed her internship as a **Customer Relations Intern** at
Mastork from **July 03rd 2024 to August 31st 2024.**

We wish you all the best for his upcoming endeavours.

Dhruv Garg

Dhruv Garg

CHIEF EXECUTIVE OFFICER



CERTIFICATE OF COMPLETION

IS PRESENTED TO :

Abhay Kumar

has completed his internship as a **Customer Relations Intern** at
Mastork from **July 03rd 2024 to August 31st 2024.**

We wish you all the best for his upcoming endeavours.

Dhruv Garg

Dhruv Garg

CHIEF EXECUTIVE OFFICER

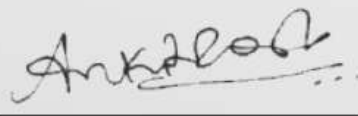
This is to certify that

Harshit Kumar

has diligently completed a comprehensive 1-month internship program
March 20 - April 20 in the dynamic realm of Marketing with **InsidellM | Kampus**.

During this tenure, HARSHIT KUMAR showcased remarkable dedication,
actively engaging in hands-on experiences and contributing positively to the team.

We wish HARSHIT KUMAR all the best for future endeavours.



Ankit Doshi
Founder



AltUni

InsidellM.com

K A M P U S

COMPLETION CERTIFICATE

Date: 14 Jun, 2023

This is to certify that **Mr. Somil Shrivastava** has successfully completed his **Summer Internship** with project title "**Marketing And Hr**" under the guidance of **Ms. Shivani Sharma**.

The duration of the project was from 10 Mar, 2023 to 10 May, 2023

The internship on evaluation fulfils all the stated criteria and student's findings are his original work.

I hereby certify his work **satisfactory** to the best of my knowledge with an aggregate grade: **B**.

Location for internship: New Delhi/Work from Home

We wish him all the best for future endeavours.

Warm Regards



(Authorized Signatory)

TEAM HR
Insplore Consultants Pvt. Ltd.

Date: 20th April, 2024

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Mr/Ms. Daksh Bhatia** has successfully completed her/his/their internship with Webnnel.

Profile: Social Media Content Intern

The Period of internship was **19.03.24 to 19.04.24**

We wish her/him/them all the very best for her/his/their future endeavours.



Nikita Arora
Founder-CEO
Webnnel
+91 9971567489
nikitaarora@webnnel.com



EXPLORATION PROGRAM

CERTIFICATE OF COMPETENCY



Tanisha

has completed her internship as Business Development Intern
from 01-May-2023 to 01-August-2023

Aiman Mohsina
HR Manager

Issued by Enord

Certificate No. : Ex23066V41



CERTIFICATE

This certificate is proudly presented to

Amrit Kumar



Scan the QR code to verify

on successful completion of "3 month" internship in "Data Analysis" from 18-Mar-2024 to 18-June-2024 at studifysuccess

sanjana

FOUNDER



abhishek

CEO



All India ITR

- Your Personal Tax Expert -

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INTERNSHIP CERTIFICATE

This is to certify that **Aryan** was working with us at Corwhite Solutions Pvt Ltd in one of the Project "ALL INDIA ITR" Taxation department as an "Intern – Taxation" from 12th June 2023 to 31st July 2023.

During his tenure with us he was smart, hardworking and a team player. He has worked to the best of his capabilities and shown tremendous efforts in learning.

We wish him all the best in his future endeavors!

Deepak Sharma

(Manager-HR)

CORWhite
CORWHITE SOLUTIONS PVT. LTD.

Office Address: Unit - 23A, 238 & 24, Spaze iTech Park, Tower 82, Sohna Rd, Sector 49, Gurugram, Haryana 122018

E-mail: info@corwhite.com, Website: www.allindiaitr.com

Phone: (0)124- 4201791

CERTIFICATE OF COMPLETION

THIS IS TO CERTIFY THAT

Mayank Adhikari

has completed her internship as Client Relationship Associate at Polar from July 5th 2024 to August 5th 2024.

We wish him all the best for his upcoming endeavors.

Jatin

Jatin Khurana
CHIEF EXECUTIVE OFFICER

Congratulations!! You are now a Times Prime Campus Ambassador



Inbox

**TIMES
INTERNET**

khushie.bhardwaj...  16 May

to me ▾



Dear Manish Kumar,

We are thrilled to announce that you have been selected to join the Times Prime Campus Ambassador Program! Your enthusiasm and drive stood out, and we are excited to see how you will bring your unique energy to our team.

As one of our newest ambassadors, you are invited to join us for an induction call scheduled for tomorrow at 5:00 PM. This call will provide you with all the necessary information about your new role and how to kickstart your journey with us. It's also a great opportunity to ask any questions you may have and to meet your fellow campus ambassadors.



CERTIFICATE

This certificate is proudly presented to

Saksham Garg



Scan the QR code to verify

on successful completion of "1 month" internship in "Finance" from 18-Mar-2024 to 18-Apr-2024 at studifysuccess

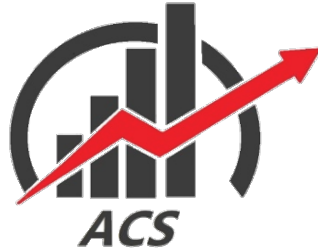
sanjana

FOUNDER



abhishek

CEO



AGILE CAPITAL SERVICES

COMPLETION CERTIFICATE

Date: 24 Oct, 2024

This is to certify that
Ms. Samriddhi Jaiswal
has successfully completed her Summer Internship with project title
"Marketing And Finance Strategies"

Under the guidance of
Mr. Siddharth
Project duration
05 Jul, 2024 to 05 Sep, 2024

The internship assessment fulfils the stated criteria and student findings are her original work.

We hereby certify her work satisfactory to the best of my knowledge with an aggregate
Grade 67

Location for internship-
New Delhi/Work from Home

We wish her all the best for future endeavours.

Warm Regards



(Authorized Signatory)
HR Department
Agile Capital Services Pvt. Ltd.

RG Trade Tower, Netaji Subhash Place, Pitampura, New Delhi- 110034

Email: info@agilecapitalservices.com

www.agilecapitalservices.com

CERTIFICATE OF INTERNSHIP

kamarth

This Certificate is Awarded to

Srishty Gupta

*in recognition of her/his hard work, dedication and punctuality
in completing all the assigned tasks as **Research Analyst** from
4th March 2024 to 3rd June 2024*



Founder

CERTIFICATE

OF COMPLETION

IS PROUDLY PRESENTED TO :

Gitali Mehra

for completing the internship program at **D DIGITAL SERVICES** as a
GRAPHIC DESIGNER.

She has worked as an Intern starting from
07 Mar 2022 to 08 Apr 2022

with great enthusiasm and shown immense potential of learning and
leadership.

We wish her all the best for her aspiring career !



Aditya Kr. Baghel
HR Director



Aman Bharti
Digital Strategist



Ashutosh Baghel
Creative Director

UID-DD/15/21-22/DU-SVC/002



CERTIFICATE

This certificate is proudly presented to

Himanshu Kumar

for their invaluable support and creativity in *Atlas Foods*. Your contributions in on-ground execution, marketing, and designing have been essential in our successful brand-building journey.

Ishitagupta

Ishita Gupta
Co-Founder



Via email to: ishitamittal2868@gmail.com

21 October 2023

To whomsoever it may concern,

This is to certify that Ms. Ishita Mittal has completed her internship in the Research and Writing Team at Unlock Consultancy ('the Company') from 16th July to 8th October 2023.

She underwent brief training, followed by three months of internship acting as a researcher and content writer for the Company. During the internship, she worked on several articles and published them through the Company's newsletter, UnlockIt.

She took a lot of initiative and consistently delivered on innovative topics, showing good skills and an attitude to learn new things. Her performance exceeded expectations and she was able to complete the allocated tasks successfully on time.

We wish her all the best for her future endeavours.

On behalf of Unlock Consultancy,

Sparsh Sehgal

Founder, Unlock Consultancy



CERTIFICATE OF INTERNSHIP

THIS CERTIFICATE IS PROUDLY PRESENTED TO

NAVNEET KAUR

In successfully Completion of "Human Resource Internship from HRI CONSULTANTS"
As HR Intern (July 2024 - October 2024)"



Authorised Signatory

HUMAN RESOURCE DEPT.



Registered Under

#startupindia

UID: YIID/10803

CERTIFICATE OF COMPLETION

This is to Certify that

Nidhi Gulati

Has completed the Internship Program at **Younity.in** as the **Management Trainee Intern** for the period starting from **3rd October 2024** to **31st March 2024** During the period of internship you were found to be punctual, hardworking and inquisitive.

We wish you all the best for your future endeavours!



MR. PRAFFUL GARG
FOUNDER & CEO
YOUNITY.IN



CANNARMA PRIVATE LIMITED

CIN No: U52311DL2022PTC402690

69/6A, 2nd Floor, Main Rama Road,
Najafgarh Industrial Area, New Delhi-110015
info@cannarma.com | www.cannarma.com

To Whom It May Concern

This is to certify that **Parkhi Juneja** has successfully completed her Marketing/Fieldwork Internship at Cannarma Pvt Ltd, from 2nd July 2024 to 30th July 2024.

During her internship, Parkhi demonstrated exceptional self-motivation and a keen ability to acquire new skills. Her performance consistently surpassed our expectations, reflecting her dedication, hard work, and proficiency in marketing tasks.

We are confident that Parkhi will excel in her future endeavors, and we wish her all the best as she advances in her career.

Sincerely,

Keshav Agarwal
(Director)
Cannarma Private Limited



CANNARMA PRIVATE LIMITED

CIN No: U52311DL2022PTC402690

69/6A, 2nd Floor, Main Rama Road,
Najafgarh Industrial Area, New Delhi-110015
info@cannarma.com | www.cannarma.com

To Whom It May Concern

This is to certify that **Rishu Maddheshiya** has successfully completed her Marketing/Fieldwork Internship at Cannarma Pvt Ltd, from 11th July 2024 to 8th August 2024.

During her internship, Rishu demonstrated exceptional self-motivation and a keen ability to acquire new skills. Her performance consistently surpassed our expectations, reflecting her dedication, hard work, and proficiency in marketing tasks.

We are confident that Rishu will excel in her future endeavors, and we wish her all the best as she advances in her career.

Sincerely,

Keshav Agarwal
(Director)
Cannarma Private Limited



ADM EDUCATION & WELFARE SOCIETY

Approved by NITI Aayog
Accredited to NGO DARPAN



STAR INTERN

OF THE WEEK CERTIFICATE



This Certificate Is Presented To



Rajni Chauhan

In recognition of extraordinary contribution during the week
22/04/2024 to 27/04/2024

Thank you for your persistent contribution towards the betterment of society.

COO



DIRECTOR



www.admedusociety.org



info@admedusociety.org



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PAN: CLXPS7996F

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12th September, 2023

TO WHOM SO EVER IT MAY CONCERN

This is to certify that **Mr. Ritesh** has completed an internship in Uni Square Concepts as a **Digital Marketing Trainee** from **1st June, 2023 to 4th September, 2023**.

During his tenure, Ritesh explored and developed his skills in diverse areas of Digital Marketing. He worked on projects involving Off Page SEO, Formatting of E-Books, Social Media Marketing and Video Editing. He is a quick learner and was able to adapt to the dynamic work environment. Ritesh worked sincerely with Uni Square Concepts, always acting as a part of the team. His management skills are also commendable. They were very well reflected in the various projects that he was able to execute for the company.

We wish him all the best for his future endeavors.

For Uni Square Concepts

Uday Senthil

Authorized Signatory

UNI SQUARE CONCEPTS
G-73/B, Basement, Kalkaji,
New Delhi-110019





THE AARAMBH ORGANISATION

A Non-Governmental Organisation



NITI Aayog

UNIQUE ID: RJ/2022/0309120

CERTIFICATE

OF APPRECIATION

This certificate is proudly awarded to

Ritesh

**for successfully completing an internship as a member of
The Aarambh Organisation and contributing sheer
hardwork and dedication**

ADITYA APURVA

PRESIDENT

JEETU CHOUDHARY

FOUNDER





UIN: YHR001183

CERTIFICATE OF EMINENCE

This certificate is proudly presented to

RITESH

for successfully completing
HR Internship as HR recruiter intern on 8th May
YoursthatSenior (P) Ltd for a tenure of **one month**.

Mohit Kadayan
Founder & CEO

Aman Meena
Head of corporate
Affairs & operations



Verified on
13/05/2023



CERTIFICATE OF COMPLETION

This certificate is awarded to

RITESH

for completing one month online Internship Program as an

Intern – Talent Acquisition

at Erekrut - a pre-hiring assessment Job Portal on

February 28, 2023


RAVINDER GOYAL

Co-Founder/MD





AJAY GOYAL

Co-Founder & CEO

<https://www.erekrut.com/> is a premium online pre-hiring assessment job portal.





06th August, 2024

To Whomsoever It May Concern

We hereby certify that **Sakshi**, has worked with **Yatra Online Limited** as a Trainee in **Finance** from **19th June, 2024 to 05th August, 2024**. During this tenure she was found to be sincere and hard working.

We wish her success in her future endeavors.

Sincerely,

For Yatra Online Limited

Dineshhwar Pratap Singh
Head-Human Resources

Sakshi

Date: 20th March, 2024

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Mr/Ms. Samridhi Kapoor** has successfully completed her/his/their internship with Webnnel.

Profile: Brand Ambassador

The Period of internship was **19.02.24 to 19.03.24**

We wish her/him/them all the very best for her/his/their future endeavours.

A handwritten signature in black ink, appearing to read 'Nikita Arora'.

Nikita Arora
Founder-CEO
Webnnel
+91 9971567489
nikitaarora@webnnel.com

Date: 20th March, 2024

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Mr/Ms. Sandeep Verma** has successfully completed her/his/their internship with Webnnel.

Profile: Brand Ambassador

The Period of internship was **19.02.24 to 19.03.24**

We wish her/him/them all the very best for her/his/their future endeavours.

A handwritten signature in black ink, appearing to read 'Nikita Arora'.

Nikita Arora
Founder-CEO
Webnnel
+91 9971567489
nikitaarora@webnnel.com



Regd. Office: Rural Handmade
12 Langbourne Place, London, E143WN
+44 7456176631, www.ruralhandmade.com
Email: Hr@ruralhandmade.com

Date: 31/01/2024

TO WHOMSOEVER IT MAY CONCERN

This is to proudly certify that **Shreya Singh from University of Delhi** has shown outstanding dedication and accomplished remarkable achievements throughout their enriching journey as **Vendor Management** intern at **Rural Handmade**. This remarkable experience took place from **12/02/2024 to 12/05/2024**, leaving a lasting positive impact on our team and organization.

During the internship period, she demonstrated an insatiable curiosity and a passion for learning. she actively engaged in various challenging projects, showcasing remarkable problem-solving skills and a strong sense of initiative.

In the course of the internship, she completed the following tasks:

- Drafted user-optimized titles for blogs on the company website using Google tools to maximize visibility and engagement.
- Designed over 25 visually captivating infographics and illustrations, effectively conveying content in more than 10 blogs.
- Leveraged best SEO practices to optimize product information, significantly boosting search engine rankings.
- Enriched product details with strategic long-tail keywords, country information, starting prices, materials, and colors..

We extend our heartfelt congratulations for their achievements and express our sincere gratitude for the remarkable dedication she exhibited during their tenure with us. May this accomplishment serve as a stepping stone to a bright and promising future. We have no doubt that she will continue to achieve greatness and leave a positive impact wherever they go.

Konrad Gero

Konark Ogra
Founder
Rural Handmade

Date: 20th March, 2024

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Mr/Ms. Sujay Patra** has successfully completed her/his/their internship with Webnnel.

Profile: Brand Ambassador

The Period of internship was **19.02.24 to 19.03.24**

We wish her/him/them all the very best for her/his/their future endeavours.

A handwritten signature in black ink, appearing to read 'Nikita Arora'.

Nikita Arora
Founder-CEO
Webnnel
+91 9971567489
nikitaarora@webnnel.com



December 15, 2023

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Ms. Sweta Singh** has successfully completed her/his/their internship with Webnnel.

Department: B-B Marketing & Sales.

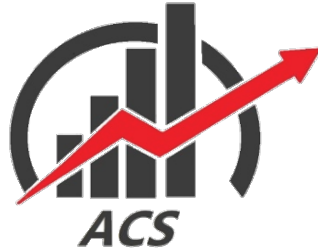
The period of internship was **1.11.2023 to 11.12.2023**

We wish her/him/them all the very best for her future endeavours.

A handwritten signature in black ink, appearing to read 'Nikita Arora', with a stylized flourish at the end.

Nikita Arora,
Founder, CEO
+91 9971567489,
2nikitaarora@gmail.com
nikitaarora@webnnel.com

www.webnnel.com



AGILE CAPITAL SERVICES

COMPLETION CERTIFICATE

Date: 12 Apr, 2024

This is to certify that
Ms. Tamanna Kumar
has successfully completed her Winter Internship with project title
"Marketing And Hr"

Under the guidance of
Ms. Shivani Sharma

Project duration
31 Jan, 2024 to 22 Feb, 2000

The internship assessment fulfils the stated criteria and student findings are her original work.

We hereby certify her work satisfactory to the best of my knowledge with an aggregate
Grade 40

Location for internship-
New Delhi

We wish her all the best for future endeavours.

Warm Regards



(Authorized Signatory)
HR Department
Agile Capital Services Pvt. Ltd.

RG Trade Tower, Netaji Subhash Place, Pitampura, New Delhi- 110034

Email: info@agilecapitalservices.com

www.agilecapitalservices.com



All India ITR

- Your Personal Tax Expert -

Powered By Corwhite Solutions Pvt. Ltd.

INTERNSHIP CERTIFICATE

This is to certify that **Tamanna Kumar** was working with us at Corwhite Solutions Pvt Ltd in one of the Project “ALL INDIA ITR” Taxation department as an “Intern – Tax Expert” from 3rd June 2024 to 31st July 2024.

During her tenure with us she was smart, hardworking and a team player. She has worked to the best of her capabilities and shown tremendous efforts in learning.

We wish her all the best in her future endeavors!

Akansha

(Assistant Manager-HR)

CORWhite
CORWHITE SOLUTIONS PVT. LTD.

Office Address: Unit - 23A, 238 & 24, Spaze iTech Park, Tower 82, Sohna Rd, Sector 49, Gurugram, Haryana 122018

E-mail: info@corwhite.com, **Website:** www.allindiaitr.com

Phone: (0)124-4201791



KOHLI MEDIA LLP PROUDLY AWARDS

CERTIFICATE

OF INTERNSHIP TO

Vansh Lakhiani

For Successfully completing the 3 Months Internship at Kohli Media LLP from
24 April 2023 - 24 July 2023 as a People Engagement Lead Intern
in Human Resource (HR)

2 November 2023

Date

Komal

Signature



E-7/16-FF, Vasant Vihar, New Delhi – 110057

Email: jayashree@consumersindia.co.in

Web: www.consumersindia.in

Blog: <https://drjayashreegupta.blogspot.com/>

The Society for Upliftment of Masses
An NGO in Special Consultative Status with the
ECOSOC of the United Nations



Certificate

This is to certify that

VANSH LAKHIANI (W-298)

Participated in the

Online 'We for Change' Research Internship Programme

From June 10, 2023 to July 31, 2023

& has successfully completed it.

Dr Jayashree Gupta
President, Consumers India

Ameeta Gupta
Convenor, Youth Activities

Renuka Mehra
General Secretary, SUM



This is an E-certificate. No signature is required.



Star Dental Centre Pvt Ltd

Registered Office :- Shop No.1, GF, Aman Avenue,
Plot No.79B, Swastik Cooperative Housing Society
Ltd., Memnagar, Ahmedabad, Gujarat-380009

HR/N/EXP/F&A/SEP 2024/1142

September 17, 2024

TO WHOMSOEVER IT MAY CONCERN

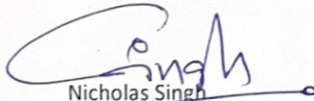
This is to certify that **Mr. Vishal Kumar Singh - INT018** has successfully completed his internship in our organization as Trainee – Finance & Accounts from June 20, 2024 to August 31, 2024.

We appreciate his efforts and contributions throughout the internship and wish him continued success in his future endeavors.

Please feel free to contact us if you need any additional information.

For Star Dental Centre Pvt Ltd

Thank You,


Nicholas Singh
Manager – Human Resources

Corporate Office :-

First Floor, Eldeco Centre, Malviya Nagar Metro Station, New Delhi-110017

CIN:U85120GJ2011PTC144115

+91-11-3924 2000 | information@clovedental.in

www.clovedental.in



CERTIFICATE OF COMPLETION

IS PRESENTED TO :

Vrinda Chanana

has completed her internship as a **Customer Relations Intern** at
Mastork from **July 03rd 2024 to August 31st 2024.**

We wish you all the best for his upcoming endeavours.

Dhruv Garg

CHIEF EXECUTIVE OFFICER

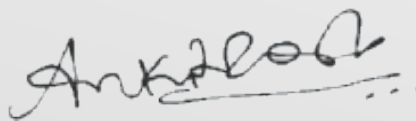
This is to certify that

Adarsh kumar

has diligently completed a comprehensive 1-month internship program
March 20 - April 20 in the dynamic realm of Marketing with **InsidellM | Kampus.**

During this tenure, ADARSH KUMAR showcased remarkable dedication,
actively engaging in hands-on experiences and contributing positively to the team.

We wish ADARSH KUMAR all the best for future endeavours.



Ankit Doshi

Founder



AltUni

InsidellM.com

KAMPUS

CERTIFICATE OF COMPLETION

Date: 30 Sep, 2024

This certificate is awarded to

Mr. Adarsh Kumar

in appreciation for his successful work as an intern in Zielhoch Company.

he has completed his Summer Internship with project title

"Marketing & Hr"

Under the guidance of

Ms. Shruti

Project duration
11 Jul, 2024 to 11 Sep, 2024

The internship assessment fulfils the stated criteria and student findings are his original work.

We hereby certify his work satisfactory to the best of my knowledge with an aggregate

Grade B

Location for internship-

New Delhi/Work from Home

We wish him all the best for future endeavours.

Warm Regards



(Authorized Signatory)
HUMAN RESOURCE
Zielhoch

Certificate of Internship

THIS IS TO CERTIFY

Akshita Aggarwal

who has completed the two months internship program from
11 Sep. 23 to 11 Nov. 23 as a Research and content intern in ConnectTheShelf with
impressive work and results.

Deepak prakash

INTERNSHIP SUPERVISOR

Manjot Kanojia

C.E.O & FOUNDER

Rural Handmade

Creating Sustainable supply chains of
handmade products for small businesses



Regd. Office: Rural Handmade
12 Langbourne Place, London, E143WN
+44 7456176631, www.ruralhandmade.com
Email: Hr@ruralhandmade.com

Date: 19/06/2024

TO WHOMSOEVER IT MAY CONCERN

This is to proudly certify that **Akshita Rawat from University of Delhi** has shown outstanding dedication and accomplished remarkable achievements throughout their enriching journey as **Sustainability Research and Talent Acquisition Intern** intern at **Rural Handmade**. This remarkable experience took place from **20/06/2024 to 20/09/2024**, leaving a lasting positive impact on our team and organization.

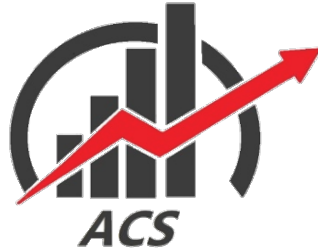
During the internship period, she demonstrated an insatiable curiosity and a passion for learning. she actively engaged in various challenging projects, showcasing remarkable problem-solving skills and a strong sense of initiative.

In the course of the internship, she completed the following tasks:

- **Talent Acquisition Leadership:** Led the recruitment process, conducting over 80 interviews across various profiles and significantly increasing intern visibility through outreach campaigns.
- **Strategic Partnerships:** Engaged with top institutions like SSCBS and NMIMS to establish academic collaborations, fostering mutual growth.
- **Research Excellence:** Conducted in-depth research on traditional crafts, providing valuable market insights for company strategy.
- **Intern Onboarding & Training:** Streamlined intern onboarding and provided comprehensive training to ensure smooth transitions and role continuity..

We extend our heartfelt congratulations for their achievements and express our sincere gratitude for the remarkable dedication she exhibited during their tenure with us. May this accomplishment serve as a stepping stone to a bright and promising future. We have no doubt that she will continue to achieve greatness and leave a positive impact wherever they go.

Konark Ogra
Founder
[Rural Handmade](http://www.ruralhandmade.com)



AGILE CAPITAL SERVICES

COMPLETION CERTIFICATE

Date: 06 Sep, 2024

This is to certify that

Mr. Aman Sharma

has successfully completed his Summer Internship with project title

"Marketing And Finance Strategies"

Under the guidance of

Mr. Akash Chaudhary

Project duration

05 Jul, 2024 to 05 Sep, 2024

The internship assessment fulfils the stated criteria and student findings are his original work.

We hereby certify his work satisfactory to the best of my knowledge with an aggregate
Grade 63

Location for internship-
New Delhi/Work from Home

We wish him all the best for future endeavours.

Warm Regards



(Authorized Signatory)
HR Department
Agile Capital Services Pvt. Ltd.

RG Trade Tower, Netaji Subhash Place, Pitampura, New Delhi- 110034

Email: info@agilecapitalservices.com

www.agilecapitalservices.com



KOHLI MEDIA LLP PROUDLY AWARDS

CERTIFICATE

OF INTERNSHIP TO

Anika Gupta

For Successfully completing the 3 Months Internship at Kohli Media LLP from
12 July 2024 - 12 October 2024 as a People Engagement Assistant
in Human Resource (HR).

15 October 2024

Date

Komal

Signature

CERTIFICATE OF COMPLETION

THIS IS TO CERTIFY THAT

Anshika Singh

*Has Completed 90 days of internship in CSR Management with
Renukiran Welfare Foundation*



Director



10-Dec-2023

Date



Regd. Office: Rural Handmade
12 Langbourne Place, London, E143WN
+44 7456176631, www.ruralhandmade.com
Email: Hr@ruralhandmade.com

Date: 01/02/2024

TO WHOMSOEVER IT MAY CONCERN

This is to proudly certify that **Anshika Singh from Delhi University** has shown outstanding dedication and accomplished remarkable achievements throughout their enriching journey as **Sustainability Research Intern** intern at **Rural Handmade**. This remarkable experience took place from **12/02/2024 to 12/05/2024**, leaving a lasting positive impact on our team and organization.

During the internship period, she demonstrated an insatiable curiosity and a passion for learning. she actively engaged in various challenging projects, showcasing remarkable problem-solving skills and a strong sense of initiative.

In the course of the internship, she completed the following tasks:

- Authored an insightful CSR Landscape blog covering various industries.
- Demonstrated strategic thinking through impactful presentations on resolving turnover and harnessing AI tools effectively
- Successfully curated and managed an extensive exhibitor list of 200+ entries, demonstrating exceptional organizational and communication skills.
- Explored and documented the evolution, best practices, and challenges of CSR, providing valuable insights for stakeholders.

We extend our heartfelt congratulations for their achievements and express our sincere gratitude for the remarkable dedication she exhibited during their tenure with us. May this accomplishment serve as a stepping stone to a bright and promising future. We have no doubt that she will continue to achieve greatness and leave a positive impact wherever they go.

Konark Ogra
Founder
[Rural Handmade](http://www.ruralhandmade.com)



Regd. Office: Rural Handmade
12 Langbourne Place, London, E143WN
+44 7456176631, www.ruralhandmade.com
Email: Hr@ruralhandmade.com

Date: 29/01/2024

TO WHOMSOEVER IT MAY CONCERN

This is to proudly certify that **Anshika Vats from University of Delhi** has shown outstanding dedication and accomplished remarkable achievements throughout their enriching journey as **Human Resource Intern** intern at **Rural Handmade**. This remarkable experience took place from **12/02/2024 to 12/05/2024**, leaving a lasting positive impact on our team and organization.

During the internship period, she demonstrated an insatiable curiosity and a passion for learning. she actively engaged in various challenging projects, showcasing remarkable problem-solving skills and a strong sense of initiative.

In the course of the internship, she completed the following tasks:

- Actively engaged in comprehensive research activities for the placement cell of multiple colleges situated in Delhi, Bangalore, and Chennai, contributing valuable insights and recommendations.
- Demonstrated proficiency in conducting interviews for candidates hailing from diverse academic backgrounds, encompassing both Indian and international universities, thereby aiding in the selection process.
- Successfully represented Rural Handmade at the internship fair hosted by Sri Venkateswara College, actively participating in interviews and effectively showcasing the organization's objectives and initiatives.
- Took the initiative in organizing and facilitating various meetings and team bonding sessions among fellow interns, fostering a collaborative and cohesive work environment conducive to productivity and mutual growth..

We extend our heartfelt congratulations for their achievements and express our sincere gratitude for the remarkable dedication she exhibited during their tenure with us. May this accomplishment serve as a stepping stone to a bright and promising future. We have no doubt that she will continue to achieve greatness and leave a positive impact wherever they go.

Konark Ogra



Date: 20th March, 2024

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Mr/Ms. Bharat Periwal** has successfully completed her/his/their internship with Webnnel.

Profile: Brand Ambassador

The Period of internship was **19.02.24 to 19.03.24**

We wish her/him/them all the very best for her/his/their future endeavours.



Nikita Arora
Founder-CEO
Webnnel
+91 9971567489
nikitaarora@webnnel.com



CERTIFICATE OF ACHIEVEMENT

THIS IS TO CERTIFY THAT

DIVYANSH SONI

has demonstrated exceptional dedication and active participation in the **Cashify Campus Ambassador Program**. Through their commitment, they have successfully completed the program, contributing to our **REUSE** campaign.

PRESENTED ON
31ST AUG, 2023




PUNEET ARORA
VP - MARKETING

CERTIFICATE OF COMPLETION

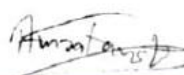


GRAPHIC DESIGNING PROFICIENCY PROGRAM

Mentor: Mr. Amratansh Sharma

Divyansh Soni

Month: July, 2023
Duration: 30 Days
Length: 30 Total Hours


MR. AMRATANSH SHARMA
GRAPHIC & UI-UX DESIGNER
AT WAVEI.AI


MR. PRAFFUL GARG
FOUNDER & CEO
YOUNITY.IN



AGILE CAPITAL SERVICES

COMPLETION CERTIFICATE

Date: 12 Apr, 2024

This is to certify that

Ms. Diya Juyal

has successfully completed her Winter Internship with project title

"Marketing And Finance"

Under the guidance of

Mr. Chinmay Tiwari

Project duration

31 Jan, 2024 to 22 Feb, 2000

The internship assessment fulfils the stated criteria and student findings are her original work.

We hereby certify her work satisfactory to the best of my knowledge with an aggregate

Grade 60

Location for internship-

New Delhi

We wish her all the best for future endeavours.

Warm Regards



(Authorized Signatory)
HR Department
Agile Capital Services Pvt. Ltd.

RG Trade Tower, Netaji Subhash Place, Pitampura, New Delhi- 110034

Email: info@agilecapitalservices.com

www.agilecapitalservices.com

Rural Handmade

Creating Sustainable supply chains of
handmade products for small businesses



Regd. Office: Rural Handmade
12 Langbourne Place, London, E143WN
+44 7456176631, www.ruralhandmade.com
Email: Hr@ruralhandmade.com

Date: 24/03/2024

LETTER OF RECOMMENDATION

I am writing to recommend **Diya Juyal** for further professional opportunities. I had the pleasure of working with Diya Juyal as **Supply Chain Analyst Intern** intern at Rural handmade.

she is a highly motivated and hardworking individual. she is always eager to learn new things and take on new challenges. she is also very organized and efficient. In addition, she is a team player and always willing to help out their colleagues. she is a creative thinker who is always coming up with new ideas and she is always looking for ways to improve existing processes.

Conducted an in-depth survey of 212 endangered crafts across India, identifying key details and government support schemes. Researched major policies promoting handicrafts through artisan clusters, technology upgrades, and marketing assistance. Authored a comprehensive blog on Kutch's diverse handicraft traditions based on empirical research. Accurately managed inventory of over 500 products through stock tracking, price analysis, and database entry.

I enthusiastically endorse **Diya Juyal** for any professional opportunity that will allow Diya Juyal to use their skills and talents to make a positive impact.

Konark Ogra
Founder
[Rural Handmade](http://www.ruralhandmade.com)

Rural Handmade

Creating Sustainable supply chains of
handmade products for small businesses



Regd. Office: Rural Handmade
12 Langbourne Place, London, E143WN
+44 7456176631, www.ruralhandmade.com
Email: Hr@ruralhandmade.com

Date: 24/03/2024

TO WHOMSOEVER IT MAY CONCERN

This is to proudly certify that **Diya Juyal from University of Delhi** has shown outstanding dedication and accomplished remarkable achievements throughout their enriching journey as **Supply Chain Analyst Intern** intern at **Rural Handmade**. This remarkable experience took place from **26/03/2024 to 26/06/2024**, leaving a lasting positive impact on our team and organization.

During the internship period, she demonstrated an insatiable curiosity and a passion for learning. she actively engaged in various challenging projects, showcasing remarkable problem-solving skills and a strong sense of initiative.

In the course of the internship, she completed the following tasks:

- Conducted an in-depth survey of 212 endangered crafts across India, identifying key demographic details, art forms, and government schemes available to support artisans.
- Researched major government policies and schemes that aim to promote Indian handicrafts by establishing artisan clusters, providing design and technology upgrades, marketing support, and other assistance to help artisans become self-reliant
- Authored a comprehensive blog post profiling the diverse handicraft traditions of Kutch district, one of India's premier craft hubs, drawing insights from empirical research on the region's artisanal industries and government schemes available to support local artisans
- Accurately managed inventory of over 500 products by tracking stock levels, estimating and analyzing Global market prices, and entering product data into the company's database..

We extend our heartfelt congratulations for their achievements and express our sincere gratitude for the remarkable dedication she exhibited during their tenure with us. May this accomplishment serve as a stepping stone to a bright and promising future. We have no doubt that she will continue to achieve greatness and leave a positive impact wherever they go.

Konark Ogra
Founder

DAVINDER SANDHU IMPEX PVT. LTD.

AN ISO 9001:2008 CERTIFIED COMPANY

===== (Govt. Of India Recognised Export House) =====

Manufacturers & Exporters of : Woollen & Cotton Hosiery Knitwears

Regd. Office : GURU NANAK DEV NAGAR, RAHON ROAD, LUDHIANA-141007(INDIA)

Phones : (O) 2612693, 2612694 Fax : (O) 91-161-2612695

Dated:-29.07.2023

To Whom So Ever It May Concern

This is to certify that Ms.Eka Koul student of **Sri Venkateswara College, Delhi University** has successfully completed a summer internship in the Finance Department 10th June 2023 To 10th July 2023 under guidance of Mr. Sandeep Dua (Finance Head)

During the period of her internship program, with us, she had been exposed to different processes was found diligent, hardworking and inquisitive.

We wish her every success in her life and career.

For Davinder Sandhu Impex Pvt Ltd

For Davinder Sandhu Impex Pvt. Ltd.



Auth. Signatory

(Authorised Signatory)



Salty E-Commerce Pvt Ltd

THIS CERTIFIES THAT

Eka Koul

has completed a 2 months internship as an
Operations and Marketing intern with Salty
between 27th January to 27th March 2023



Kanishka Garg
CO-FOUNDER

Date: **20 November 2024**

Employee Name : **Eka Koul**
Employee Code : **1002815**
Designation : **Trainee**
Department : **MARCOM Department**

Subject: - RELIEVING & EXPERIENCE LETTER

Dear **Eka Koul**,

This has reference to your resignation which has been accepted and you are relieved from the services on the close of working hours of **29 October 2024**. As per our record your date of joining was **01 August 2024** and your last place of posting was **Signature Towers, Gurgaon**.

We thank you for your efforts and contribution during your tenure with us and wish you all the best in your future endeavors.

With Best wishes,

For **Signatureglobal Developers Private Limited**



Rohan Chopra
Group CHRO

CC :- Personal File

This letter is computer generated and therefore does not require any stamp or signature



CERTIFICATE

OF BRAND AMBASSADOR

This Certificate is Proudly Presented to:

Jeshu Anand

Thank you for serving as Webnnel's Brand Ambassador between Nov-Dec 2023. Please accept this token of our appreciation for your support in creating awareness about our brand, 'Webnnel'.

Nikita Arora

Founder-CEO
Webnnel





Forage

Inspiring and empowering
future professionals

Geshu Anand

Data Analytics and Visualization Job Simulation

Certificate of Completion
September 18th, 2024

Over the period of August 2024 to September 2024, Geshu Anand has completed practical tasks in:

Project Understanding
Data Cleaning & Modeling
Data Visualization & Storytelling
Present to the Client

A handwritten signature in black ink, reading "Caroline Dudley".

Caroline Dudley
Managing Director
North America
Recruiting

A handwritten signature in black ink, reading "Tom Brunskill".

Tom Brunskill
CEO, Co-Founder of
Forage

Enrolment Verification Code fZR3Hs5tMn3KNz8Tp | User Verification Code a2E4bjqw2QKpwXXj9 | Issued by Forage

This is to certify that

Jaiwardhan Singh Kang

has diligently completed a comprehensive 1-month internship program
March 20 - April 20 in the dynamic realm of Marketing with **InsidellM | Kampus**.

During this tenure, JAIWARDHAN SINGH KANG showcased remarkable dedication,
actively engaging in hands-on experiences and contributing positively to the team.

We wish JAIWARDHAN SINGH KANG all the best for future endeavours.



Ankit Doshi

Founder



AltUni

InsidellM.com

KAMPUS



UNNATI
(THE KNOWLEDGE HUB FOR CIVIL ASPIRANTS)

Presents

Certificate of Internship Completion

This is to certify that Ms. Liza Pasha of
school/college/institution.....Sri Venkateshwar College.....
worked as an intern inBusiness Development.....department for a
period of 6 months (12th March 2022 - 12th September 2022) and has
successfully completed her internship .

Vasudha

Vasudha
(Vice-President)
UNNATI

Lokesh Chugh

Lokesh Chugh
(Founder and Chairman)
UNNATI



UMEED
A Drop of Hope

NGO REGISTRATION NO. S/792/DIST.SOUTH/201

Ref No. UD23/FI-5521
Date: 14-05-2023

Certificate of Internship

We present this certificate to

Ms. IRAM FATMA

In appreciation for your successful work as an intern at Umeed-A Drop of Hope in the area of Social Work, Human Resource, Finance & Marketing.

The internship was conducted between 15-04-2023 and 14-05-2023.

During the tenure of this internship the candidate was found to be dedicated, hard working and efficient.

Subhrajeev Gautam
Subhrajeev Gautam
(Founder & Secretary)



Crowwd SRL

INTERNSHIP CERTIFICATE

To Whom It May Concern,

This is to certify that Manasvi Bajpai has successfully completed the internship program at Crowwd as an Financial Analyst Intern. Manasvi participated in the program from the 17th of June 2024, until the 1st of August 2024.

During her stay at the company, Manasvi displayed enthusiasm, leadership, self-discipline, and self-motivation. She contributed high-quality fundamental analyses on Crowwd's platform, attaining the top ranks among thousands of investors and making a significant impact during our weekly meetings.

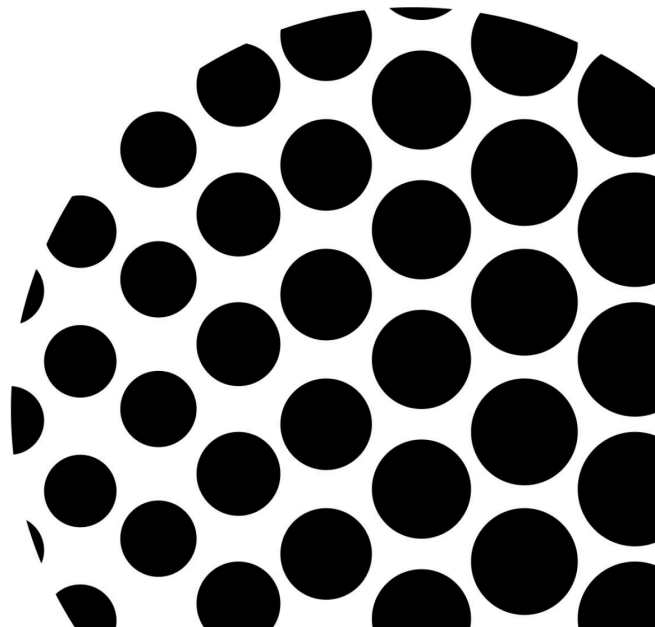
We were fortunate to have Manasvi as one of our interns, and we wish her all the best in his future endeavours.

Sincerely,

Cheif Growth Officer, Crowwd
a.gupta@crowwd.io



www.crowwd.io
© Crowwd. All rights reserved.





Web: www.digioptimer.com
Email: info@digioptimer.com
Phone: [+918826516013](tel:+918826516013)

To Whom It May Concern

1 July, 2024

Mr. Manish Gupta.

This letter is to certify that Mr. Manish Gupta successfully completed his 30 day internship with Digi Optimizer. **on "Business development (U.S shift)". His internship tenure was from 1 June, 2024 to 30 June, 2024.** He was Working with Digital marketing Team and was actively & diligently involved in the projects and tasks assigned to him.

During the span, we found him punctual and hardworking person. His learning powers are good and he picks up swiftly.

We wish him a bright future.

Best Regards,

Vibhor Gupta | Director





AGILE CAPITAL SERVICES

COMPLETION CERTIFICATE

Date: 22 Aug, 2022

This is to certify that

Ms. Mansi Somani

has successfully completed her Summer Internship with project title

"Marketing And Training Program In An Organization"

Under the guidance of

Mr. Chinmay Tiwari

Project duration

21 Jun, 2022 to 21 Aug, 2022

The internship assessment fulfils the stated criteria and student findings are her original work.

We hereby certify her work satisfactory to the best of my knowledge with an aggregate

Grade 70

Location for internship-

New Delhi

We wish her all the best for future endeavours.

Warm Regards



(Authorized Signatory)

Head HR

Agile Capital Services Pvt. Ltd.

RG Trade Tower, Netaji Subhash Place, Pitampura, New Delhi- 110034

Email: info@agilecapitalservices.com

www.agilecapitalservices.com



G S C & Associates

Chartered Accountants

418, Tower B4, Spaze I-Tech Park,
Sec 49, Gurugram, HR- 122018
+91-124-4285052 / +91-9990661260
info@gscassociates.in

TO WHOMSOEVER IT MAY CONCERN

Dated: 25th September 2023

It is our pleasure to inform you that **Ms. Neha Kataria** has worked with us from 5th June 2023 to 22nd September 2023. She was working with **G S C & Associates** at the position of **F&A Intern**.

During this tenure mentioned above, **Ms. Neha Kataria** has remained involved with duties and responsibilities assigned to her. We found her competent and active with sincerity and determination. She is professionally sound and hard-working, whose dedication in taking contribution and initiative for the organization has proven helpful in the establishment repeatedly.

Sincerely,



Thanks & Regards
CA Gautam Sachdeva
Partner
G S C & Associates
Chartered Accountants

COMPLETION CERTIFICATE

Date: 04 Oct, 2024

This is to certify that **Mr. Paras Jain** has successfully completed his **Live Project** with project title "**Marketing & Finance Strategies**" under the guidance of **Mr. Siddharth**.

The duration of the project was from 29 Jul, 2024 to 29 Sep, 2024

The internship on evaluation fulfils all the stated criteria and student's findings are his original work.

I hereby certify his work **satisfactory** to the best of my knowledge with an aggregate grade: **67**.

Location for internship: New Delhi/Work from Home

We wish him all the best for future endeavours.

Warm Regards



(Authorized Signatory)

TEAM HR
Insplore Consultants Pvt. Ltd.

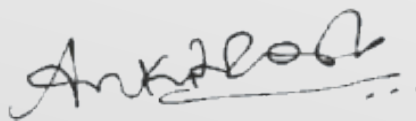
This is to certify that

Rupalee Agrahari

has diligently completed a comprehensive 1-month internship program
March 20 - April 20 in the dynamic realm of Marketing with **InsidellM | Kampus**.

During this tenure, RUPALEE AGRAHARI showcased remarkable dedication,
actively engaging in hands-on experiences and contributing positively to the team.

We wish RUPALEE AGRAHARI all the best for future endeavours.



Ankit Doshi

Founder



AltUni

InsidellM.com

K A M P U S

13 Apr, 2024

To,

Shauryavir Pratap Singh

DELHI

SHAURYAVIRPRATAPSINGH@GMAIL.COM

8447769128

We are pleased to confirm that Shauryavir Pratap Singh from SVC has successfully completed his Internship with Project Title '**MARKETING AND FINANCE**' from 28 Nov, 2023 to 28 Jan, 2024.

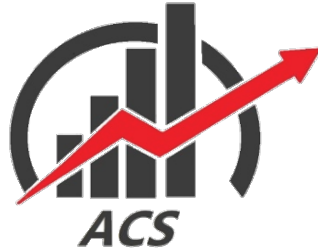
Aggregate on the basis of his performance during the Internship: 50%.

Location for internship: (Delhi/Work from Home)



(Authorized Signatory)

Head HR
AIM India Pvt. Ltd.



AGILE CAPITAL SERVICES

COMPLETION CERTIFICATE

Date: 24 Oct, 2024

This is to certify that

Ms. Samriddhi Jaiswal

has successfully completed her Summer Internship with project title

"Marketing And Finance Strategies"

Under the guidance of

Mr. Siddharth

Project duration

05 Jul, 2024 to 05 Sep, 2024

The internship assessment fulfils the stated criteria and student findings are her original work.

We hereby certify her work satisfactory to the best of my knowledge with an aggregate
Grade 67

Location for internship-
New Delhi/Work from Home

We wish her all the best for future endeavours.

Warm Regards



(Authorized Signatory)
HR Department
Agile Capital Services Pvt. Ltd.

RG Trade Tower, Netaji Subhash Place, Pitampura, New Delhi- 110034

Email: info@agilecapitalservices.com

www.agilecapitalservices.com

28 Aug, 2024

To,

Shray Bhardwaj

DELHI

SHRAYBHRDWJ@GMAIL.COM

9024769558

We are pleased to confirm that Shray Bhardwaj from SVC has successfully completed his Internship with Project Title '**MARKETING AND FINANCE STRATEGIES**' from 29 May, 2024 to 29 Jul, 2024.

Aggregate on the basis of his performance during the Internship: 62%.

Location for internship: (Delhi/Work from Home)



(Authorized Signatory)

Head HR

AIM India Pvt. Ltd.



All India ITR

- Your Personal Tax Expert -

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INTERNSHIP CERTIFICATE

This is to certify that **Vikram Kumar** was working with us at Corwhite Solutions Pvt Ltd in one of the Project "ALL INDIA ITR" Taxation department as an "Intern – Taxation" from 12th June 2023 to 31st July 2023.

During his tenure with us he was smart, hardworking and a team player. He has worked to the best of his capabilities and shown tremendous efforts in learning.

We wish him all the best in his future endeavors!

Deepak Sharma

(Manager-HR)

CORWhite
CORWHITE SOLUTIONS PVT. LTD.

Office Address: Unit - 23A, 238 & 24, Spaze iTech Park, Tower 82, Sohna Rd, Sector 49, Gurugram, Haryana 122018

E-mail: info@corwhite.com, **Website:** www.allindiaitr.com

Phone: (0)124- 4201791



Issued On:
June 27, 2023

Presents this

CERTIFICATE

OF INTERNSHIP TO

Deepa

for his/her successful completion of the Internship programme at FinChase for the role Finance and Marketing Intern from March 15, 2023, to June 15, 2023.

We wish you success in all of your future endeavours!

A handwritten signature in black ink, appearing to read "Prateek Bansal".

Prateek Bansal
(Co-founder, FinChase)

CERTIFICATE OF INTERNSHIP

kamarth

This Certificate is Awarded to

Deepa

*in recognition of her/his hard work, dedication and punctuality in
completing all the assigned tasks as Human Resources Intern from
4th March 2024 to 3rd June 2024*



Founder



UMEED
A Drop of Hope

NGO REGISTRATION NO. S/792/DIST.SOUTH/201

Ref No. UD23/FI-6122
Date: 30-05-2023

Certificate of Internship

We present this certificate to

Mr. HARDIK KOTHARI

In appreciation for your successful work as an intern at Umeed-A Drop of Hope in the area of
Social Work & Marketing.

The internship was conducted between 01-05-2023 and 30-05-2023.

During the tenure of this internship the candidate was found to be dedicated,
hard working and efficient.

Subhrajit Gautam

Subhrajit Gautam
(Founder & Secretary)

